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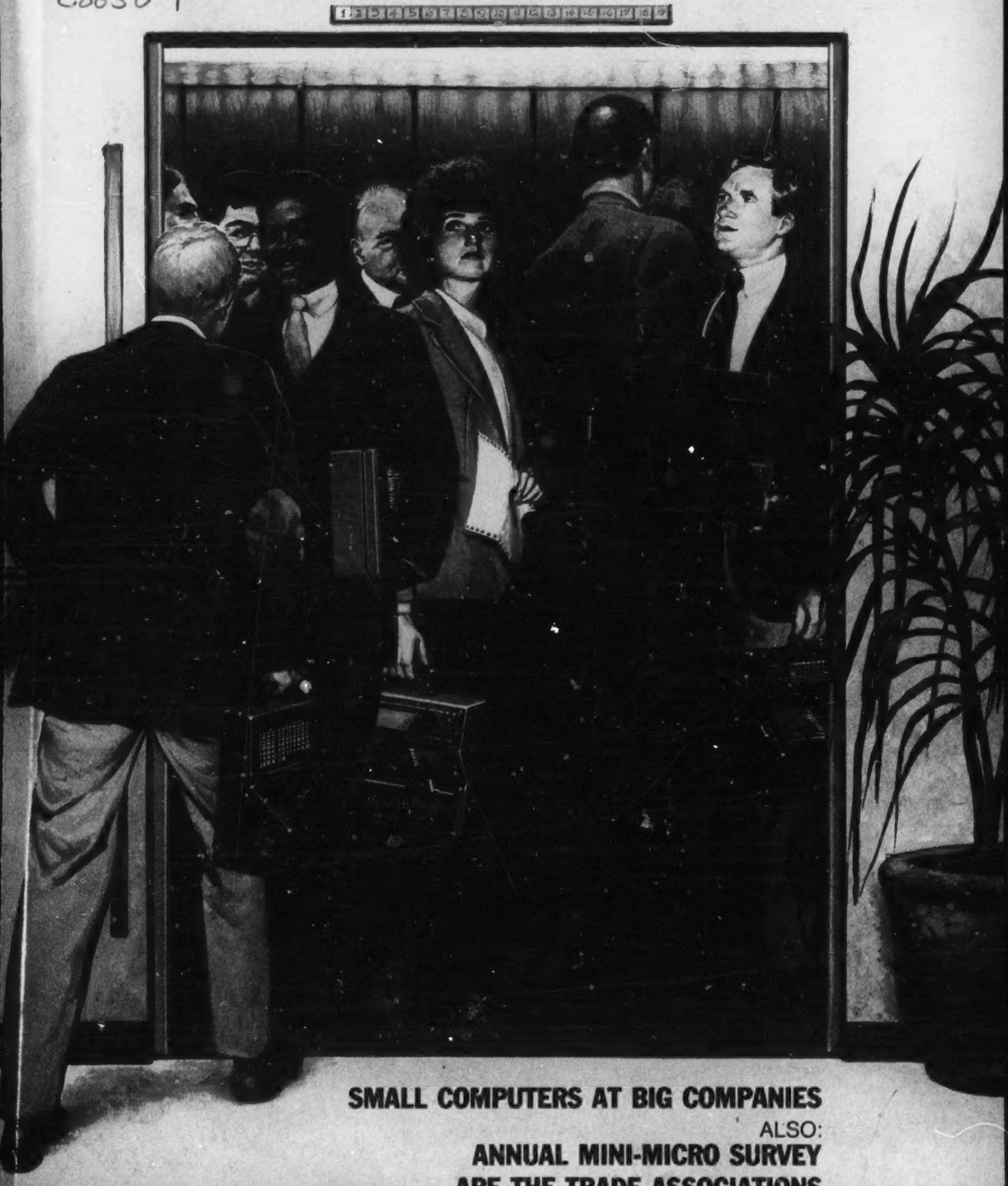

SMALL COMPUTERS AT BIG COMPANIES

ALSO:

ANNUAL MINI-MICRO SURVEY

ARE THE TRADE ASSOCIATIONS WORTH THEIR SALT?

DATAMATION®

NOVEMBER 1982/$4.00 U.S.A.
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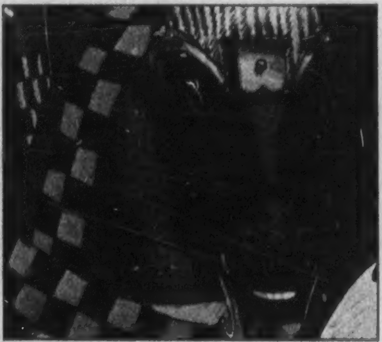

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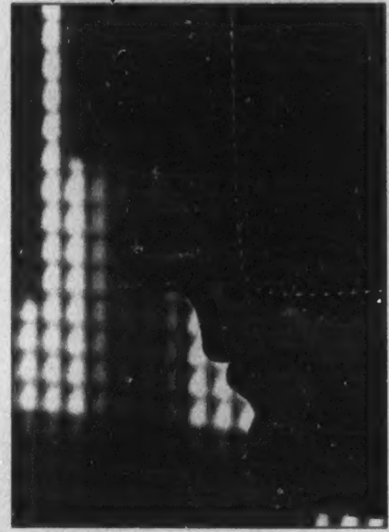

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IN FOCUS

1982 MINI-MICRO SURVEY

Mini sales are slowing as the micro comes on strong; networking is increasing in popularity.

by John W. Verity

Like the rest of the industry, the small computer market looks like it has a tough year ahead of it, according to this year's DATAMATION/Cowen & Co. survey of small computer users. The traditional mini will suffer the most as the personal computer and other micro-based systems steal away new installations and erode existing ones.

This year's survey, taken in July, is based on responses received from 6,743 DATAMATION subscribers throughout the U.S., who said they have more than 44,000 small computers, office systems, and intelligent terminals installed. More than 3,300 of the respondents in the survey said they also had already purchased and installed personal computers, which are the subject of increased analysis this year.

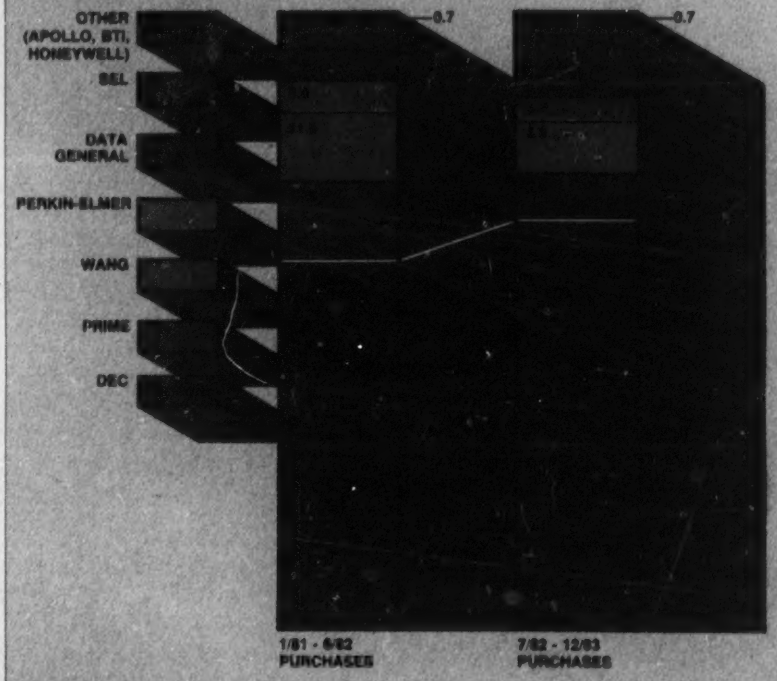
In total, for all applications, 3,278 respondents reported taking delivery of 13,242 minicomputer systems with an estimated purchase value of about $900 million during the 12 months preceding the survey. For the subsequent 12 months, 2,466 users reported plans to purchase 14,542 systems valued at roughly $950 million.

Minicomputer industry shipment growth in the area of 12% to 13% is projected for the year ending June 1983, a figure sharply lower than the more than 23% growth forecast in last year's survey. The figures are adjusted to take estimated new users into account.

Those new users remain a significant source of minicomputer industry growth, but the rate of expansion from them continued to slow, a trend that has been evident for several years. This year's figures showed a 7% growth in new users over 1981, compared to 11% last year over 1980. The overall growth rate for the past eight years is 19%.

Over the past five years, the new user compound growth rate for the overall

FIG. 1
DEC SHARE OF 32-BIT MARKET CONTINUES TO GROW
PERCENT OF RESPONDENT 32-BIT SYSTEMS PURCHASES

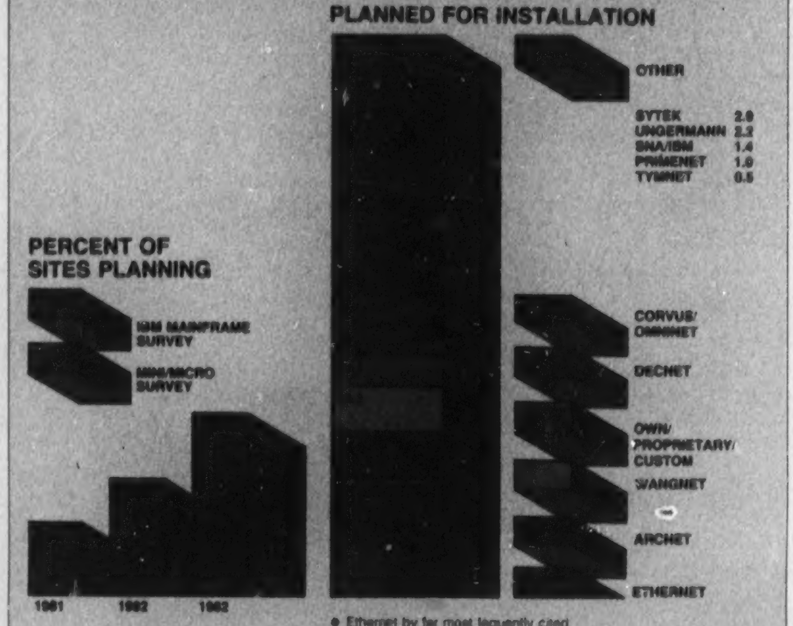


* 4.1% from a single site large end user purchase of 100 Prime 250 systems.
- Significant share increase indicated for SEL also.

FIG. 2

EIGHT PERCENT OF RESPONDENTS PLAN TO IMPLEMENT LOCAL NETWORKS

Query: Will your organization install a non-phone line local area network (such as Ethernet) during 1982/83?



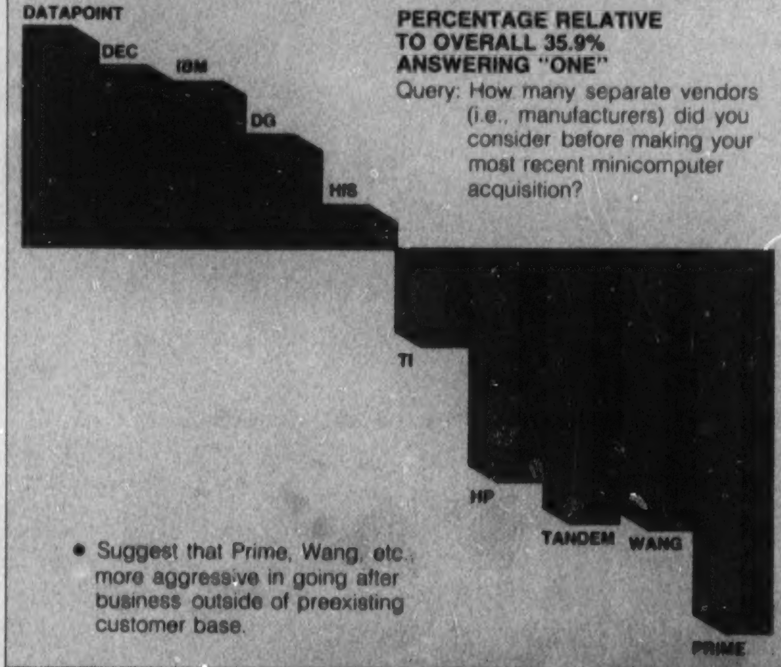
- Ethernet by far most fequently cited
- Some confusion among minority of respondents re definition of local network

FIG. 3

DEC AND IBM ENJOY HIGHER THAN AVERAGE INCIDENCE OF SINGLE-SUPPLIER PROCUREMENTS

PERCENTAGE RELATIVE TO OVERALL 35.9% ANSWERING "ONE"

Query: How many separate vendors (i.e., manufacturers) did you consider before making your most recent minicomputer acquisition?



- Suggest that Prime, Wang, etc. more aggressive in going after business outside of preexisting customer base.

survey base was 16%, but was a more moderate 11% for the oem-only segment of the base. Systems houses showed a 19% growth rate and end users a 16% rate.

The strongest growth in new-to-the-industry minicomputer users was seen in business data processing and office systems applications, which showed growth of 14% and 13% respectively. The lowest such growth was in the education category, where a figure of 7% is thought to reflect inroads being made by the personal computer.

As for applications of minicomputers in general, industrial automation showed a drop as the percentage of the dollar value of shipments compared to the previous year, while medical/biophysical lab, office systems, and business data processing (standalone and distributed) showed gains. Education and training, too, showed a slight drop.

Office systems seems to be an arena Digital Equipment, Prime, and Wang are doing well in; that was the application most often cited for DEC machines planned for installation in 1982 and 1983.

Software and support continue to increase as a percentage of the spending planned by minicomputer users. Previous to last July, respondents said, they spent 18.6% on support while in the following 12 months they will spend 19.5%.

Database management system (DBMS) usage among minicomputer respondents is heaviest in shops where Hewlett-Packard, Microdata, and Tandem are the principal mini suppliers. In the network software category, Tandem is far and away the leader, with 60% of its sites involved. It is followed by ModComp (which sells primarily into the industrial automation market), Burroughs, Datapoint, and Four-Phase.

Industry growth of 12% to 13% is projected for the year ending June 1983, a figure sharply lower than the 23% forecast in last year's survey.

DBMS usage is expected to grow 17% compounded over the next two years, while network software is pegged at 35% for the same period. Some 28.3% of the respondents said they were using mini DBMS software and another 10% said they will install it for the first time in the coming year. As for network software, 9.2% of all respondents are using it, with another 7% planning to add it during this year and next.

Some interesting data concerning the field of local networking were revealed by this year's survey. Asked what the primary mode of minicomputer use was, respondents showed a discernible increase in peer networks, or connecting minis to each other without an intervening host. This year's figure of 5.7% of sites using peer networking is up from last year's 4.0% and is thought to signify the increasing use of local networking.

Host networking accounted for 12.2% of the sites responding while 65.9% said they ran standalone minis interactively; the remaining sites ran standalone batch systems.

In response to a question of whether they intended to install non-phone line local networks, 8% of the respondents said they would during 1982-83. Of those, 20.9% said they would use the Ethernet scheme promoted by Xerox, Intel, Digital Equipment, and a host of other firms. After that came 8.7% for Datapoint's Arcnet, 8.3% for Wangnet, 5.8% for DECnet, and 5.1% for the Corvus/Omninet designed for Apple computers. Some confusion was seen in the respondents' understanding of the definition of a local network, perhaps because the concept is a relatively new one.

Interestingly, local networking seems to have gained more interest among the mini users in this survey population than was seen in a sample of IBM mainframe users surveyed by DATAMATION/Cowen earlier this year (May, p. 34).

Users continue to be loyal to their mini suppliers; 82.6% said they had no plans to switch.

Each year the mini-micro survey investigates what factors are important to users in selecting their machines. As has been the case in the last two years, hardware reliability is the main factor, followed by vendor reputation.

Asked if they expected to change principal mini suppliers over the next 12 months, 10.7% of the responding sites said they were seriously considering it, 6.7% said would make a switch, and 82.6% said they had no such plans. The comparable figures from last year's survey were 11.3% considering, 7.2% yes, and 81.5% no.

In terms of the vendors as principal suppliers, Tandem continued to show the highest loyalty among customers, with only 7.5% of its sites saying they were planning or considering a switch. Last year the firm showed a figure of 0.0%. DEC and IBM also fared well at 11% each. The highest risk of defections was seen in figures for Northern Telecom, with its aging base of Data 100 and Sycor equipment; ModComp; Computer Automation; and Univac, which a few years ago took over the Varian Data customer base.

Software support was the most cited reason for considering a switch of vendors, particularly among end users. Oem/systems house respondents cited price and software support as the main factors in considering a change.

Until the end of 1981, customers of DEC had stated to previous surveys that they

FIG. 4

APPLICATIONS SOFTWARE DEVELOPMENT FOR PERSONAL COMPUTERS VS. MINICOMPUTERS

Query: Who primarily develops the applications software for your organizations?

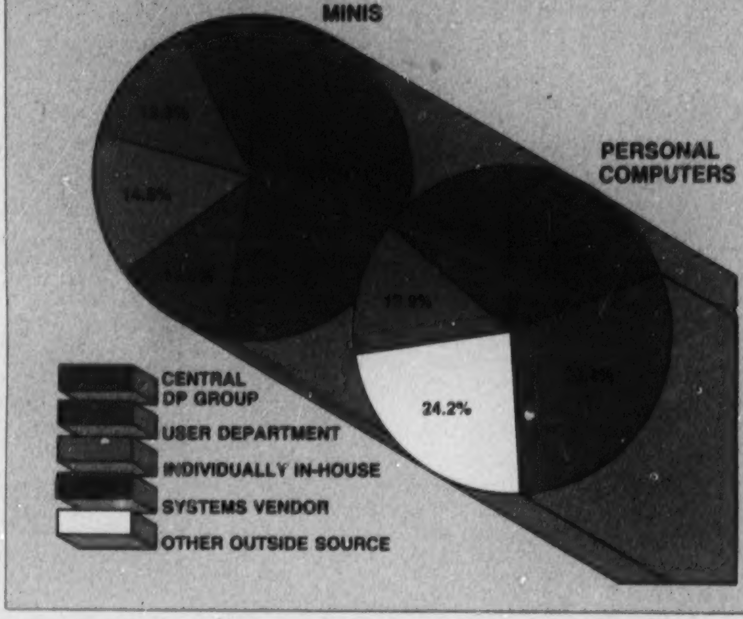
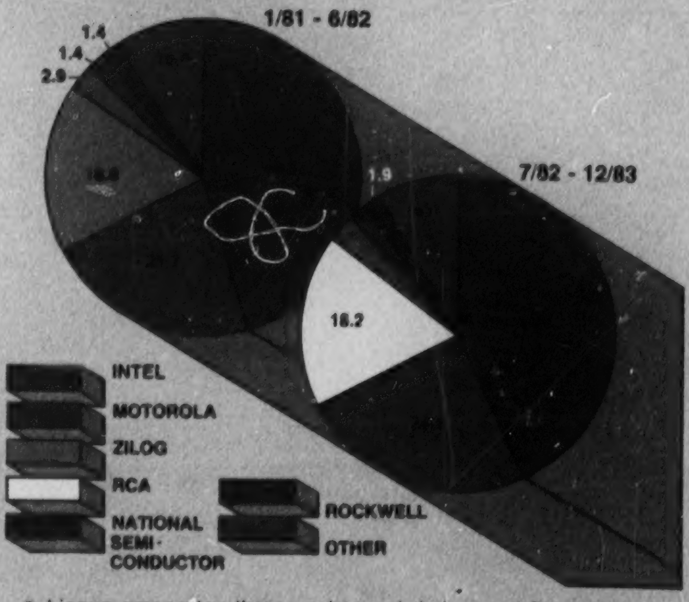


FIG. 5

INTEL STILL THE MOST FREQUENTLY CITED MICROPROCESSOR CHIP SUPPLIER

PERCENT OF SITE MENTIONS



- Lineup among top three unchanged during past five surveys.
- 25% of these sites planning 16-bit microprocessor purchase during 7/82-12/83, up from 13% in 1/81-6/82.

were upset with the company's inability to deliver equipment fast enough, but that logjam has since been cleared up. Among those sites considering a switch of main vendors, only 5.8% of those with DEC as that vendor were considering a switch because of delivery schedules. Last year the figure was 19.3% and the year before,

The trend toward single-supplier procurements of all types of mini-based systems—small business machines, traditional minis, intelligent terminals, and office systems—continues. In those categories 32%, 37%, 31%, and 28% of all sites, respectively, said they were considering a single source. In general, the data suggest a continuing process of consolidation favoring already established suppliers.

DEC and IBM, according to the survey, enjoy a higher-than-average incidence of single-supplier procurements. In contrast, it appears that Wang and Prime are more aggressive in going after business outside their existing customer bases. Also, the data show that Hewlett-Packard is the most frequent competitor of DEC while IBM is the most frequent competitor at HP sites.

The strongest peripherals shipment growth this year will be in small hard-disk drives and graphics terminals.

In addition to investigating central processors, the survey questioned users about their buying plans for peripherals to attach to those systems. On average, 63% of the responding sites said they specify the cpu supplier for peripherals as well. The vendor that gains the most peripherals sales from its processor users is HP, with an 81% share. It is followed by Wang, IBM, Datapoint, Tandem, and Honeywell, which are all above average. Below average, in order, come DEC, Data General, Perkin-Elmer, and Prime.

The strongest peripherals shipment growth this year will be in small hard-disk drives and graphics terminals. Disks under 50 megabytes are enjoying a shipment growth rate of about 103% compared to last year, while the terminals show a rate of 76.7%. The leading disk suppliers are International Memories Inc., Seagate Technology, and IBM, while the terminals suppliers named most by respondents were DEC, HP, and Data General.

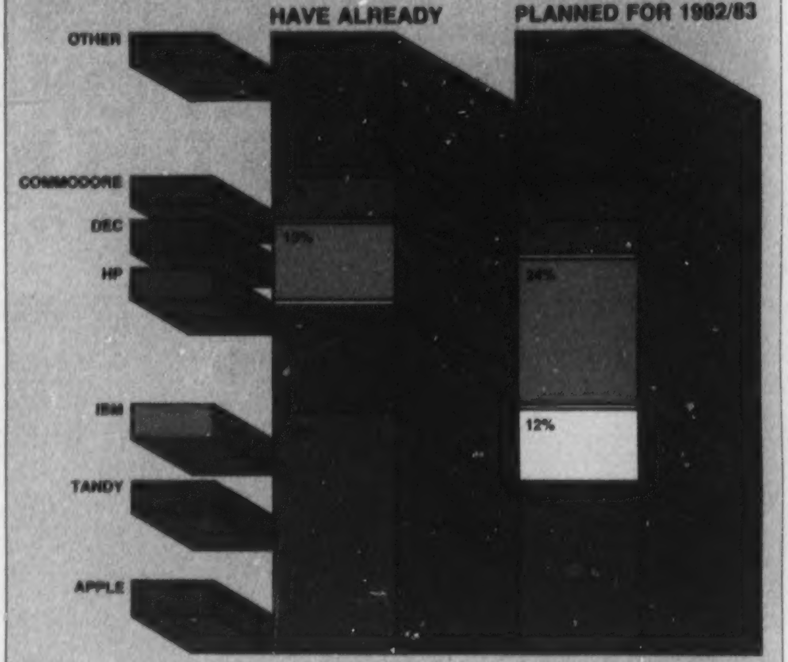
DEC is the leading peripherals supplier to the survey's population, selling the largest share of hard disks over 50 megabytes, graphics crts, and add-on memories. Shugart gained the top slot in supplying floppy disk drives over Micropolis, according to survey data.

The amount of disk storage being attached to minicomputers is on the rise again after the plateau seen in last year's survey. The average amount of disk storage on systems this year was 262 megabytes,

FIG. 6

PERSONAL COMPUTER PURCHASES

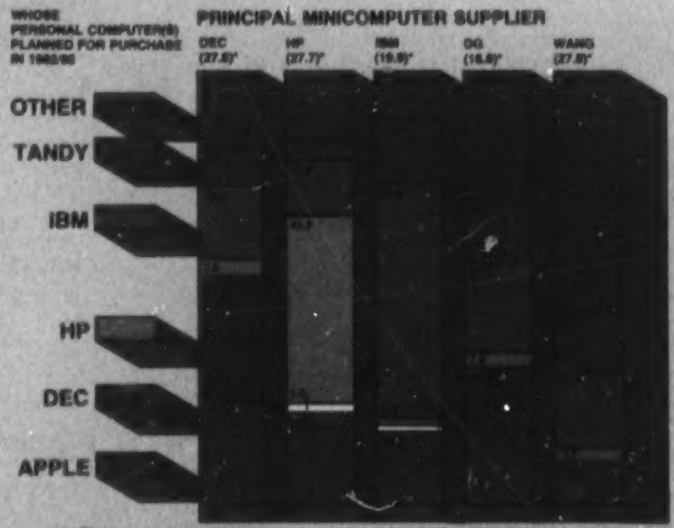
Query: Have you or your organization purchased or are you planning to purchase micro-based personal computers?



- IBM share of prospective installations twice that of previous installations
- Three times for DEC off much smaller base
- HP percentage relatively steady

FIG. 7

EFFECT OF MINICOMPUTER SUPPLIER ON PERSONAL COMPUTER CHOICE



* Figures in parentheses represent percent of sites planning personal computer purchase during 1982/83. ** 38.9% Wang.

- Still-broad penetration of DEC minicomputer user base and of IBM base by Apple, notwithstanding subsequent PC introductions by these mini systems suppliers themselves.

TABLE I

TOP 10 MINICOMPUTER SYSTEMS 1982/83

A. Based on number of respondents acquiring systems (7/82-12/83)

MANUFACTURER	SYSTEM	HOW MANY SITES ACQUIRING	AVG. UNITS/ SITE
DEC	VAX-11/780	147	2.1
DEC	VAX-11/750	102	1.4
IBM	System/38	92	1.1
HP	3000 Unspec.	92	2.2
IBM	System/34	82	1.4
DEC	PDP-11/44	81	1.5
IBM	Series/1	75	7.1
DEC	VAX Unspec.	78	1.5
DEC	PDP-11/23	69	12.4
DEC	VAX-11/730	61	1.6

B. Based on number of units being acquired (7/82-12/83)

MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE ($ MILLIONS)
DEC	PDP-11/23	857	$23.0
IBM	Series/1	533	21.4
DG	Nova Unspec.	341	4.5
DEC	VAX-11/780	311	103.7
DG	Nova 4	287	3.2
TI	990 Unspec.	274	12.9
IBM	8100	208	20.6
HP	3000 Unspec.	200	36.1
DEC	VAX-11/750	144	25.5
Datapoint	8600	132	2.4

- In total, 2,466 respondents (37%) reported plans to purchase 14,542 systems valued at roughly $950 million betwen 7/82 and 7/83.

compared to last year's figure of 143 megs and the year before's figure of 149 megs. (The numbers relate to disks attached to the last system purchased.) It is thought that the data reflect a greater strength in high-end systems such as DEC's VAX. Tandem led the pack in average disk size, with 502 megabytes attached to its average system. At the other end of the scale was Datapoint with 64 megabytes and Northern Telecom with 28 megs.

Average main memory size of minicomputers also continued to rise, this year reaching 551,000 bytes. Last year's comparable figure was 383,000 bytes. The increase was seen in equipment from almost every vendor. A more dramatic growth in main memory was seen in microcomputers, where the average size this year was 95,000 bytes compared to 55,000 bytes last year. This clearly bodes favorably for memory chip suppliers, who can expect to sell very large unit volumes.

In terms of peripherals purchases for personal computers, 79% of users running such machines said they bought printers, 74% bought monitors, 79% bought floppy disks, and 31% bought rigid disks.

The survey this year revealed a shifting pattern of distribution in the minicomputer system market. The oem/systems house and dealer/distributor categories each showed a slight increase as the channel by which respondents received their machines. Shipments directly from manufacturers fell slightly from last year's survey, while retail stores did not change at all. A small increase in sales through used equipment dealers was seen, possibly indicating an increasing maturation of the traditional mini market.

Pricing and discounts as competitive tools were seen as particularly important to Prime, Perkin-Elmer, and Texas Instruments. As expected, IBM was at the low end of the list of discounters.

Average main memory size of minis has continued to rise, this this year reaching 551,000 bytes.

Outright purchase remains the predominant mode of acquiring minicomputer equipment. In terms of dollar value, Data General, DEC, and TI machines were leased (largely via third parties) least often, Datapoint and IBM most frequently.

The survey data show DEC increasing its total market share, largely as a result of projected VAX and PDP-11/23 shipments. In the past 18 months, DEC held a 34.5% share of the dollar value of minicomputer shipments, but in the coming 18 months respondents indicated they would spend 39.5% of their minicomputer money with DEC. Close behind was IBM, which had comparable figures of 14.2% for the past 18 months and 13.7% for future spending. Next was HP with 9.8% past and 9.0% future spending.

In the small business sytems submarket, IBM led with a 30.0% share of past 18 months' purchase value and a projected 24.2% for future spending. DEC followed with 14.7% past and 14.9% future. It was shown that HP, Tandem, and Wang are picking up share in the small business systems segment, as is newcomer Convergent Technologies. The drop in projected IBM shipment values was attributed to the aging System/34 product cycle. Sizable declines were also seen for Data General (dropping to 6.3% from 4.8%), Honeywell, and Burroughs.

In the traditional minicomputer market, DEC was far ahead of the pack in terms of percentage of 18-month-past and future purchase values. The firm showed a 44.1% rating for the past 18 months and a 47.1% share for future purchases. Next was IBM, with 9.4% past and 11.0% future, indicating perhaps that its Series/1 product is still gaining in this market. IBM has garnered a strong second place in the minicomputer market a mere six years after entering it with the Series/1.

Prospective shipment trends look weakest in the traditional minicomputer segment of the market, according to the survey data. But in sharp contrast, the personal computer segment is expected to experience a 99% increase in unit volume and a 114% increase in dollar volume with about half of the growth projected to come from new users. Roughly 60% of previous users are planning to purchase personal machines in the current year as well. The average number of units will be six or seven and the average price per unit will be $4,600, according to the survey.

Thus it appears that the personal computer market will be a significant source of incremental growth for those minicomputer manufacturers who can effectively participate in it.

Growth in the traditional mini market is coming more and more from the 32-bit arena, where unit and dollar volumes are ahead of the overall market's growth. In terms of units, planned purchases of 32-bit machines for the year ending June 1983 will make up 11.8% of overall minicomputer unit shipments. In terms of dollars, however, those machines will make up 36% of

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TABLE II

PERCENT OF SITES PLANNING/CONSIDERING VENDOR SWITCH

MANUFACTURER	1980 SURVEY	1981 SURVEY	1982 SURVEY
Basic Four	16.9	32.7	26.5
Burroughs	29.6	27.0	29.5
Computer Automation	23.1	31.8	46.2
Data General	18.2	22.0	25.0
Datapoint	9.4	15.2	22.4
DEC	12.8	13.2	11.0
Four Phase	20.0	19.6	29.2
General Automation	53.8	60.0	25.0
Harris	24.6	30.0	25.0
Hewlett-Packard	10.6	10.7	14.3
Honeywell	17.9	21.4	15.7
IBM	11.9	12.8	11.1
Microdata	20.3	16.2	25.0
Modcomp	17.9	23.3	36.4
NCR	19.8	15.5	22.4
Northern Telecom (Sycor)	41.7	30.0	52.6
Perkin-Elmer	19.8	26.2	18.0
Prime	8.3	8.2	14.1
SEL	11.1	16.7	13.6
Tandem	6.9	0.0	7.5
Texas Instruments	14.5	18.3	16.8
Univac/Varian	22.6/23.3	26.7/38.5	32.6
Wang	15.6	19.3	16.1
Total Sites	17.2	18.6	17.4

- Tandem continues to enjoy highest degree of customer loyalty.
- Consistently high also for IBM and DEC.
- But some deterioration in this year's data for HP and Prime, albeit to still better than aggregate percentages.
- Negative trend of past two years for Datapoint and Data General persisted in 1982 survey.

purchase value during the same period. This is occurring despite a modest drop in the 32-bit system unit price, generally attributed to a changing mix of systems at DEC, the 32-bit leader, to newer, smaller VAX systems.

In fact, DEC's share of the 32-bit market is even greater than its share of the total market and it is growing. Survey respondents indicated that 66.4% of their 32-bit system purchases will be from DEC during the 18-month period ending in December 1983. Following DEC are Wang, with an 8.9% share; Prime at 7.6%; SEL at 7.5%; and Data General at 5.0%. Perkin-Elmer's share will drop from 5.0% of purchases made in the previous 18 months to 3.9% in the next 18-month period.

Interest in personal computers was found to be proportional to the organization's size. For companies under $50 million in annual revenues, only 21.5% said they would emphasize personal computers for future small system applications while in the over-$500 million category, 30.4% of respondents said they would do so.

Potential incursion of the personal computer into minicomputer markets seems strongest in the office systems segment. The machines will be used most, the survey indicates, by organizations involved in education, insurance, and business services and least by communications suppliers, utilities, and wholesale/retail operators.

Fueled by IBM's entry into the personal computer market, the year-to-year expansion of personal/desktop computers was even more rapid in 1982 than a year ago. The latest three-year compound growth rate for such machines was 109% for all sites, 87% for personal use, and 113% for organizational use. The figures from last year's survey are 106%, 94%, and 107%, showing that organizational use of the machines is growing faster than personal use. Indeed, 86.7% of the machines purchased by respondents will be for organizational use.

IBM's entry into the market has

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TABLE III

REASONS FOR PLANNING/CONSIDERING VENDOR SWITCH

	PERCENT OF "SWITCHING SITES" DISSATISFIED WITH:					
CURRENT PRINCIPAL VENDOR	DELIVERY SCHEDULES	PRICE	HARDWARE RELIABILITY	SOFTWARE SUPPORT	SALES/ SERV ORG.	OTHER
Basic Four	11.1	22.2	11.1	50.0	27.8	22.2
Burroughs	3.0	15.2	33.3	57.6	21.2	21.2
Computer Automation*	16.7	16.7	—	66.7	50.0	33.3
Data General	4.9	20.7	30.5	35.4	28.0	23.2
Datapoint	21.1	18.4	13.2	26.3	26.3	31.6
DEC	5.8	23.1	22.4	34.0	24.4	25.6
Four Phase	7.1	3.6	21.4	50.0	17.9	21.4
General Automation*	—	25.0	25.0	75.0	—	50.0
Harris	—	9.1	27.3	72.7	9.1	9.1
Hewlett-Packard	2.5	22.8	16.5	30.4	24.1	36.7
Honeywell	—	4.8	33.3	66.7	9.5	19.0
IBM	6.8	31.5	15.1	38.4	21.9	24.7
Microdata	—	—	23.5	41.2	35.3	35.3
ModComp	—	16.7	25.0	41.7	8.3	25.0
NCR	—	20.0	20.0	40.0	33.3	20.0
Northern Telecom (Sycor)	—	20.0	60.0	20.0	20.0	30.0
Perkin-Elmer*	—	—	22.2	66.7	33.3	11.1
Prime	3.4	31.0	31.0	37.9	17.2	27.6
SEL*	—	—	—	100.0	—	66.7
Tandem*	—	—	33.3	33.3	—	33.3
Texas Instruments	5.6	38.9	11.1	11.1	44.4	22.2
Univac	—	7.1	50.0	71.4	14.3	21.4
Wang	6.5	16.1	19.4	22.6	38.7	29.0
Total Sites	5.0	20.5	22.6	39.5	22.2	27.8

* Less than 10 sites

helped accelerate this trend. Also, IBM personal computers appear to be purchased more centrally than other brands.

The most important selection criterion for PCs is software, followed by price, product reputation, and compatibility with installed machines. Compatibility seems to be especially important to those buying DEC, Wang, and Zenith PCs.

It looks as if packaged software for personal computers will sell slightly better, in terms of future growth, than hardware. For the 12 months following the survey date, respondents said they would spend 87.7% of their personal computing budget on hardware and 12.3% on software. VisiCalc, and its look-alikes, is by far the most used software package, representing about 56% of all packaged software mentions by respondents. Word processing was the next most popular software purchase with about 25% of the mentions.

As for distribution of personal machines, the independent store was the most frequently cited channel. For IBM, only 7% of its personal computers were being bought through IBM-owned stores.

Unlike the IBM personal computer, DEC's and HP's small machines have apparently made little impact outside their base of minicomputer users. However, Apple has maintained a strong penetration into IBM and DEC minicomputer user sites.

In terms of future shipments, 2,359 responding sites said they would purchase 35,667 personal machines during the 18-month period ending in December 1983. During the previous 18 months, 3,360 respondents purchased 22,410 units. Of the planned purchases, 31.3% will be Apples, 18% IBM, 10% Tandy, and 7.3% DEC (vs. 40.7%, 15.1%, 9.6%, and 1.4%, respectively, of machines installed during the previous 18 months).

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architectures entail many processors working together to solve a problem as opposed to the single-processor, or von Neumann, design used in traditional machines. It is generally thought that parallel machines will provide far greater future improvements in computer performance than can be gained from improved semiconductor technology.

Parallel systems are expected to be necessary to handle the so-called artificial intelligence functions that it is hoped future machines will perform. Japan's proposed fifth generation machine, in fact, is to include such subsystems as a "knowledge base management system," "inference engine," and "inferotemporal cortex machine," according to literature presented at the Tokyo conference last year. Theoretically, at least, the fifth generation machine and others of its ilk would process knowledge, not just numerical data.

"We've never had a big enough program to do crash projects. We've only been able to scratch the surface."

One of the parallel systems already being funded by ARPA is the Non-Von (for non-von Neumann), whose principal designer is Dr. David Elliot Shaw, a professor at Columbia University in New York. Construction of a Non-Von prototype will be helped by a two-year, $2.5 million ARPA contract. Although its development is in the early stages, the Non-Von project provides a good picture of the kind of cooperative resources ARPA could bring into play should a national computer research effort get under way.

Non-Von is to be composed of as many as a million microprocessors arranged in a binary tree (each element in the tree is connected to two elements below it) and will handle traditional commercial data processing tasks as well as the numerical processing usually reserved for supercomputers, according to Shaw.

"We're using tiny microprocessors which are actually quite slow individually," the professor explained. "Each one is much smaller than an [Intel] 8080. I'd say that one instruction on a conventional 16-bit microprocessor would be the equivalent of four or five instructions on the micros we're going to use."

The micros Shaw plans to use are being custom designed at Columbia and will most likely be manufactured by a West Coast semiconductor maker, he said. Their packaging will be different from most microprocessors in that several (perhaps a few dozen) micros will be packaged with accompanying RAM memory on a single silicon substrate.

This method reduces manufacturing costs, increases performance, and helps keep down maintenance efforts on the finished machine.

The custom chips are being logically defined on a color CAD/CAM system, said Shaw, noting that once the definitions are finished they will be sent electronically to the West Coast for fabrication. The means of transport, of course, is the ARPANET, which connects many advanced computing research labs in the country. In Marina Del Rey, Calif., the Information Sciences Institute will process Columbia's definitions and produce standard mask tapes with which a semiconductor maker can finally produce the chips, which will be sent to Shaw's group on Manhattan's Upper West Side.

In addition to helping buy chips, the ARPA grant will aid Shaw in recruiting a small team of "extraordinarily gifted engineers and computer scientists," who will join the two dozen or so workers already involved. Although "only a handful" of such individuals exist, Dr. Shaw said he believes that "the kind of superstar we're looking for will be unable to resist the temptation to help build the world's most powerful computer."

Two corporations, IBM and Digital Equipment, are also aiding, and presumably keeping an eye on, the Non-Von project. IBM's "very generous" $600,000 funding came with an open invitation to "talk shop" at the firm's Yorktown Heights, N.Y., research facility. DEC has been kind enough to discount some VAX gear quite heavily and is also developing a working relationship with the Columbia researchers, according to Shaw. "We're very interested in contact with manufacturers," he said. "What we're doing now is in the public domain. We're pushing the frontiers of science."

A parallel computer architecture is being worked on by a dozen or so ARPA-backed researchers at Columbia University.

Non-Von and other microprocessor-intensive systems are just the type of machines ARPA would like to investigate, according to Robert Kahn. "Non-Von and New York University's Ultra machine are examples of the kind of projects that could be accelerated," he commented. "We had once funded the dataflow machine at MIT, but then the Energy Department took over."

The next job for Kahn and his boss Cooper, it would seem, is to sell their idea to budget writers at the Department of Defense and then to Congress itself. With the Japanese industrial specter looming as large as it does in the general press, in Detroit unemployment lines, and in Silicon Valley, ARPA's idea may be one whose time has come.

—John W. Verity

FAULT TOLERANCE

FAIL-SAFE VENDORS EMERGE

About a dozen makers of fault-tolerant computers can be identified in a market that Tandem for eight years called its own.

As if by prearranged signal, it suddenly has become evident that a flotilla of fault-tolerant computer makers has emerged, mucking up waters that had previously been the exclusive province of Tandem Computers. Tandem, founded in 1974 and shipping hardware since May 1976, has prospered in its own little pond, closing its latest fiscal year in September with revenues of more than $300 million. But by one estimate, there are a dozen or so companies already in or preparing to enter the fray.

Not to worry, says consultant David Gold of San Jose, Calif. "I think there's a big enough market out there for them and Tandem and probably lots of others without any of them feeling the pain from competitors."

By one count, fault-tolerant computers have applications in process control and industrial automation in general, in certain shared-logic word processing systems, in microcomputer networks that allow for the sharing of resources, and in on-line transaction processing. When all those applications are included, the market in 1986 will come to almost $22 billion, says Omri Serlin of Los Altos, Calif. The consultant, who just completed a study of this market and its participants, says the current vendors and those planning first product introductions by the end of '83 will be able to realize only some 15% of that demand. That leaves the rest of the market to be satisfied by conventional minicomputer and mainframe approaches.

Into this market has come a ton of companies with systems built around the ubiquitous microprocessor chip. The vast majority of them are going after the on-line transaction processing market, which Tandem also serves. Serlin estimates that these startup companies have been funded by venture capitalists to the tune of more than $50 million, and the transaction processing market they are entering has a potential of almost $17 billion by '86. He sees Tandem taking $2.5 billion of that total, the upstarts being able to grab much less, and the majority of it not realized by the current crop of systems makers.

The transaction processing market can trace its genesis back to the 1960s,

TABLE I

FAULT-TOLERANT SYSTEMS MARKETS IN 1986
(BILLIONS OF 1981 DOLLARS)

SEGMENT	POTENTIAL	REALIZABLE	% PENETRATION
On-line transaction processing	$17.0	$3.3	19
Data acquisition, process control	3.6	0.24	7
Microcomputer networks	0.6	0.02	3
Word processing	0.9	0.05	5

Source: ITOM International Co.

Present and future vendors of fault-tolerant systems are expected to capture only a fraction of the enormous markets that will potentially exist in 1986. By '86 Tandem is expected to be a $2.5 billion company.

when business transactions were initially recorded with paper and pencil, the data then being keypunched at night and run against files stored in the computer. In the 1970s, with the development of database management systems, on-line inquiries to a database became economically feasible, but updates were generally made at night in the batch mode. It is thought that in the '80s the new vendors will make it possible for transactions in real-time to occur against a database, much like the airline reservations systems and automatic bank teller machine transactions.

"Microprocessors are giving these newcomers new technological ways to approach the fault-tolerant operation," Serlin says, and those design approaches are significantly different from Tandem's. The environment today, he adds, is similar to what existed when Tandem started in '74. At that time, Tandem was able to take advantage of a mature minicomputer technology, harnessing the small processors to offer attractive price-performance levels in competition with mainframers like IBM and Univac.

"You have the same situation now," he explains, "except now it's working against Tandem." Today people are able to harness the power of very powerful 16-bit microprocessors that cost a mere $40 or $50 each, showing how such processing power can be plugged in to satisfy redundancy requirements and to provide ever more processing power upgrades.

Indeed it is not certain that Tandem's NonStop systems sell so well because of their fault-tolerant features. "The fault-tolerant capability is the sizzle," says Dave Gold, "but I think in fact a lot of people buy Tandem because it's incrementally upgradable, and they have a nice database system and networking and so on."

Similar sentiments are expressed by the head of a software company that has developed an integrated, interactive, manufacturing software system that runs on the Tandem system. The fault-tolerant feature, says Redwood Software president C. Stephen Johnson, "wasn't the first thing that attracted us to do something on a Tandem." Rather, he says, it was the graceful growth capability and the networking facilities.

With this networking capability and the ability to plug in more processors as they're needed, Tandem's users can grow their system as their needs grow, and without rewriting their applications programs—which are completely insulated from the configuration details. The user need not know how many processors there are or what particular peripherals are connected to what specific processor.

(Up to 16 processors will fit into a Tandem cabinet, but more can go into an adjoining box. The company's networking software allows up to 255 of them to work together. The largest user is Tandem itself, with more than 140 systems, something like 400 processors worldwide. And there are paying customers who have hundreds. To date, the company has shipped more than 4,000 processors.)

"There's a big enough market out there for Tandem and lots of others without any of them feeling the pain from competitors."

The idea of merely adding another processor whenever the workload demands it is very appealing to the user. It is perhaps in recognition of this appeal that a number of startups have entered this business. Serlin names a dozen in the U.S. and the U.K.

One such company is Synapse Computer Corp., Milpitas, Calif., which was founded in August 1980 and is already funded to the tune of almost $14 million by a number of investors. The firm uses Motorola 68000 microprocessors both as dedicated processors to run applications programs and as dedicated I/O processors. The distinguishing feature of Synapse's product is the absence of local memory at the processors that execute user programs, which instead share a central memory in a tightly coupled fashion. In a design called N + 1, it provides as many applications processors as are required by the workload, plus one more for redundancy. The performance range is said to be from the equivalent of a VAX 780-class machine, or an IBM 4341, up to an IBM 3081.

"Computers are becoming a part of everyday life," explains Synapse president Mark Leslie. "People are getting used to seeing terminals, dealing with automatic teller machines." With the cost of disk storage declining twice as rapidly as the cost of silicon, he says, "people are putting more and more [data] on-line and want more users to have access to it."

That is an observation made also by consultant Serlin. He notes that Tandem has been in the on-line environment, where users simultaneously are making inquiries to a database. This means the system experiences very short bursts of activities—and you don't need a very powerful cpu for that. You need instead very powerful access to peripherals, disks in particular.

"The cpu requirements are not very high," he says. "That was one of the major reasons Tandem succeeded—recognizing that characteristic." The founders saw that they could attack this market more effectively with multiple minicomputers, whereas people at that time were applying large mainframes to such systems tasks.

In some applications, of course, a small processor will run out of steam, and the Tandem processors are no exception. Redwood Software's Johnson says he sometimes wishes he had the use of a bigger computer than Tandem's mini, which runs out of horsepower on jobs that run in the batch mode, such as modeling.

Is he happy with Tandem's 16-bit architecture? "Well, I would like them to go to a 32- or a 64-bit design," Johnson says, "and they probably will some day. But [the 16-bit architecture] is not a tremendous limitation right now." The original NonStop is, of course, limited to the direct addressing of 128K bytes, which prompted the development of the NonStop II and its 32-bit addressing scheme and the use of an address translation box. Now, when Johnson's software is made to run on the NonStop II, it would be possible for programs to build larger date arrays. And the programs wouldn't have to go out to disk as often.

"I think some of the new architectures that are coming out have a lot of advantages over Tandem," Johnson adds, advantages that stem from the use of more recent technology. But he cites Tandem's networking capabilities, its database system, and various software tools and says, "Tandem has a lot of advantages over most of the newer computers coming out."

The technology issue has to do with more than the addressing space, even though the Motorola 68000 processor can

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address up to 16MB. "The key issue between all the new competitors and Tandem is the use of microprocessors," says Serlin. He avers that what Tandem can't afford to do is provide the kind of redundancy that, for example, another new vendor, Stratus, provides. This Natick, Mass., startup has two processors working together, checking each other's work. If there is disagreement between them, they declare themselves bad and another duplicated unit, which has been working alongside the first pair, takes over. "You could not possibly do this economically with the minicomputer approach," he adds.

With Tandem, an application is loaded into processor A, which automatically stores a duplicate in processor B, which is running a different job. By passing messages, the status of the original processor and the program it is running is communicated to the other processor. When the original processor goes down, thereby failing to send a message, the work is picked up by the second processor. But in this setup, there is no idle processor that merely serves as a backup or standby, waiting for another processor to fail.

In such a setup, there is no central repository of data about what the system is doing. The processors are linked to a high-speed bus by which they keep up-to-date on

NEWS IN PERSPECTIVE

FAULT TOLERANCE, TO A DEGREE

As with most other things, there are degrees of fault tolerance. At one end of the scale is the conventional system—the everyday computer—that offers fault tolerance, self-checking, or hardware redundancy. At the opposite extreme is the continuous, nonstop processor that never crashes, offers total hardware redundancy, and checks itself constantly.

Moving toward this ideal is the Tandem NonStop configuration, whose phenomenal success now has spawned a whole new industry. With the Tandem setup, two central processors handle separate data processing loads and constantly check each other's operation. Either can take over both jobs if one should fail. The failed cpu must then be brought back through software and programmer intervention.

Digital Equipment Corp. is expected to continue this approach next year, when it's targeted to make a dual VAX 11/80 configuration available. (An earlier attempt with PDP-11/70s failed.) IBM is another company that is expected to offer a special purpose dual configuration using 4300s. Like Tandem, both these companies will rely on scarce and much needed programming resources in the event one processor fails, experts point out.

Like most new ventures, Synapse Computers, Milpitas, Calif., has the option of a more technologically current approach to nonstop than Tandem did when its systems debuted in 1976. The availability of step-function semiconductor technology, coupled with a powerful new operating system, offers Synapse the chance to bring a processor back using hardware alone, but before this can happen the system has to crash for a brief time.

In contrast, Natick, Mass.-based Stratus Computer Corp., currently Tandem's only major competitor, seems to have produced a crash-proof, totally redundant system. Both its design team and architecture have been highly praised. Stratus president Bill Foster and his team developed a Noah's Ark system wherein all main controller boards—cpu, memory, disk, communications, and tape controllers—"go in two by two" and constantly check each other.

Foster says that a failure in any one of the components does not affect the system in any way, and the broken component can be replaced while the system is running. The Stratus exec also claims that he can offer a self-checking system for just 3% more than the cost of his own conventional computer. "The additional cost for self-checking is only a very small part of the total system cost, since peripherals, software, and service—together making 80% of the total—remain unchanged," he says. This potent fact is the key to the tremendous success Stratus is currently enjoying.

"Everywhere you turn, people costs are rising, and with them the costs of down time, systems and applications software, and service," Foster explains. "In stark contrast, the primary elements in our approach—electronics and peripherals—are getting less expensive by the minute. This means that what is an advantage today will become an even bigger advantage in the future."

Currently Foster does have one nagging problem—when, and by how much, to increase his sales force. His current team of 15 should triple by year-end, and his installation count should double from 20 to 40. The company will become profitable next year and could touch sales of $200 million by 1986, Foster told a recent DATAMATION/Cowen & Co. conference.

Stratus will be joined next year by at least three other East Coast fault-tolerant contenders: Parallel Computers, Englewood Cliffs, N.J.; Sequoia Systems, Natick, Mass.; and Computer Consoles, Rochester, N.Y. Companies claiming fault tolerance in other market segments, such as data acquisition and process monitoring and control, shared disk word processing, and local area network-based micros sharing a word processor, include August Systems, Salem, Ore.; Syntrex, Eatontown, N.J.; and DOSC, Albertson, N.Y.

But for all these fault-tolerant suppliers, it will be a question of degree.

—R. E.

what is going on. Each processor has its own copy of the operating system.

By contrast, the Synapse system uses a shared memory with data about what's happening in the system. All processors, except the I/O processors, run off this main memory. It raises questions about the bandwidth of that memory and when it might run out of capacity. Additionally there's the concern about a single point of failure existing, especially in a fault-tolerant system. If one portion of main memory fails, one or more processors could also be forced to go down.

But all that may be academic. Processor failures have become so rare that the concern might be more with disk failures. Or, as Omri Serlin notes, "It's errors on the part of the users in creating those transactions that are causing most of the problems in the database." He thinks the issue of fault tolerance is difficult to prove, that customers just take the word of the manufacturer. Others, too, say that fault tolerance can be achieved by the hardware design, by the operating system design, and the way applications programs are written—using checkpointing, for example. And they observe that users tend to rely only on the first two factors, both provided by the system vendor, for their safety. Besides, there may be other reasons people have been buying the Tandem NonStops. And those other reasons are just as important as, if not more important than, fault tolerance.

—Edward K. Yasaki

REGULATIONS

BOTHERED BY EMI?

Electromagnetic interference from PCs is a problem for vendors, users, and the Federal Communications Commission.

Computer users will little note nor long remember Federal Communications Commission Docket 20780. The FCC is doing its utmost to ensure that manufacturers and vendors will never forget it.

The document is not that difficult to commit to memory. It sets forth FCC rules for computing devices. The rules are an attempt to limit radio emissions from computers and associated devices using digital circuitry in order to minimize the potential for interference to television and radio communications. You might not think your lovable personal computer is capable of snowing out your neighbor's television, but it is. As Casey Stengel so often said, you could look it up.

In the course of its investigations into products being offered for sale to the masses in retail stores, it has come to the FCC's attention that some manufacturers don't want to play by the rules. To try and ensure that everyone can join the game—let us not forget that this is a participatory democracy—the commission has begun hitting violators where it hurts. Three fines have been issued, with guarantees of more to come. The price is $2,000 per offense, with the total not to exceed $5,000.

"Of the products we found offered for sale in stores, 31.9% were not authorized by the rules," said Paul Harris of the FCC's Field Operations Bureau. "We looked at computers, FM radios, and cordless telephones. That's a significant noncompliance rate. It's three times what it should be. We hope for perfection, but we sure don't expect it. A 10% noncompliance rate would be acceptable.

"Of the products we found offered for sale in stores, 31.9% were not authorized by the rules."

"I don't know if they just don't want to comply or they're not following the rules out of ignorance. But we're going to fine people. We'll fine the manufacturers before the retailers. We'll give the retailers a citation, then fine them if we catch them again. We feel justified in doing it. This is a potentially serious problem that we'd like to end before it becomes unsolvable."

"This is a cause for great concern in the industry," admitted a source at a major computer manufacturer. "The rules have created a production and cost impact on the industry, although I don't think companies are as upset now as a few years ago. Over the long run the cost impact is not that great. Now most companies are aware of the rules and are struggling to comply. There is some basis for these rules. The FCC isn't being unreasonable."

Here's the way the whole thing started. Silly, but it's true.

As computers were fruitful and multiplied, so did complaints to the FCC of interference to tv and radio reception where the source of the bad vibes was identified as some form of computer. Exhibit A: purchasers of a popular computer marketed to the general public complained the machine totally destroyed tv reception in their own and neighbors' homes. Exhibit B: one of the leading personal computer manufacturers (reportedly IBM) has discovered that occasionally, while running the vendor's financial spreadsheet programs, the user finds simple arithmetic beyond the scope of the machine.

The FCC's first attempt to cope came in April 1976, when it instituted a rulemaking proceeding—the aforementioned Docket 20780—to clarify the rules governing restricted radiation devices (including computers) and to provide more realistic limits at VHF and UHF frequencies.

Enter the Computer and Business Equipment Manufacturers Association. It requested in January 1979 that the rules be adopted specifically for computing equipment. The petition requested more liberal limits than those established in the 1976 notice in Docket 20780. The commission heeded that plea in its order of October 1979, but established an equipment authorization procedure to become effective July 1, 1980.

Deciding that life is too short for that much of a hassle, the industry prevailed upon the FCC to relax the compliance schedule and make a number of minor modifications to the computer rules. The rules were further revised in 1981. Final measurement rules for computing equipment were released in March 1981. None of these permutations altered the thrust of the FCC's First Commandment: thou shalt comply.

The commandment binds both halves of the computer universe. Class A computing devices are those marketed for use in a business/commercial/industrial area. Class B devices are those marketed for use in a residential (home) environment. Using such a computer in a business does not change the classification. A personal computer is a subclass of the Class B solar system.

The FCC has also decreed two equipment authorization procedures that "are not optional for the manufacturer," as it notes in Bulletin OST (Office of Science and Technology) 54. Before either of the computer types can find its way to market, it must be either verified or certified. Class A devices need only be verified. Under that procedure a manufacturer tests the device to determine if it complies with the applicable FCC standard. As soon as he is satisfied that the answer is yes and labels the device as required, he may begin marketing it.

"This really is the first example of the government regulating computers."

Life is much harsher in the Class B world. Not only must those devices submit to stricter emission standards, they cannot be legally sold without being certified. Under that system the applicant, normally the manufacturer, files an application with the FCC. The application must include: 1) a detailed report of measurements, 2) a block diagram of the computing device, 3) a narrative statement describing how the device operates, 4) the instruction manual furnished to the purchaser, 5) photographs showing the general appearance and component layout of the equipment, and 6) an engineering drawing or photo of the proposed equipment identification nameplate.

The FCC also reserves the right to request the equipment for a pregnant sam-

How are corporations responding to the onslaught of the personal computer? A survey.

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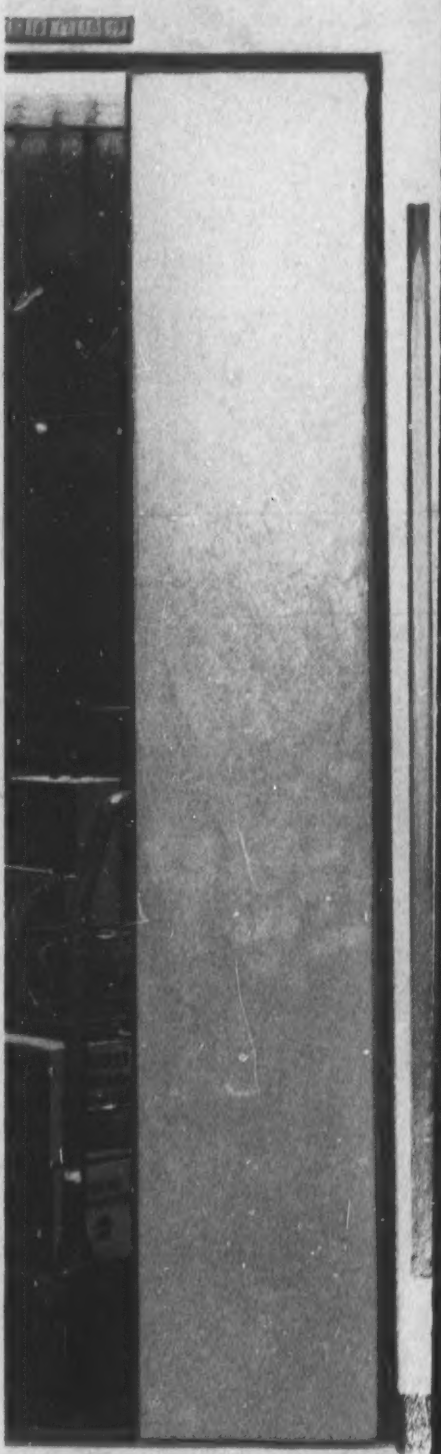

TOM NEWSOM

by Amy D. Wohl and Kathleen Carey

Most computer-related technology has been slow to make its mark on the average office. This has been due mainly to the cost and complexity of implementing the equipment—barriers that required a high degree of marketing expertise on the part of the manufacturers to cost-justify the products and then to train and support the office user. Word processors are an example of this slow process, taking over 15 years to arrive in significant numbers on the office scene.

Electronic calculators and now their more powerful cousins—personal computers—are exceptions to this rule. The calculator took just five years to clobber the old adding machine in the office. The personal computer is showing signs of gaining a strong foothold in the office in an even shorter period of time, both as a lower-cost alternative to dedicated word processors and as a computation or information processing tool for individual managers, professionals, or executives. Indeed, the personal computer may even affect the ways dp departments handle regular data processing within the corporation, and could provide the gateway for automating the office in the '80s.

Why the forecast for a quick success? First is cost: hardware and software are relatively cheap. Even today's simple, game-playing personal computers come with a bang-per-buck price tag that would have been impossible just a decade ago. Second is perceived complexity. Though just as hard (or easy) to use as, let's say, a word processor, the personal computer, coming from a home, game-playing environment, is perceived as simple to use or apply. Vendors don't have to go into gyrations to sell the product, and need not do much (if any) user handholding.

Finally, personal computers now come supported by a wide variety of software. Third-party packages compatible with the "universal" operating systems of CP/M, MS-DOS, Apple DOS, TRS-DOS, etc., allow personal computers to be applied to a great many office and business tasks. True, much of this software may come from basement or garage shops, but there are increasing numbers of good packages being marketed by reputable program houses.

So, with or without the blessing or knowledge of corporate management, personal business computers (PBCs) are now being squirreled away in the nooks and crannies of almost every office. Many managers are unable to say just how many are currently installed in their organizations, and opinions on how to govern their acquisition and application are many and varied.

To gauge the extent to which PBCs have penetrated the corporation, and to determine their users and uses, Advanced Office Concepts conducted a survey. The following discussion summarizes the results found in AOC's full report, *Policy for the Personal Business Computer*.

Of the almost 250 corporate users responding, fully 26% came from the ranks of the U.S.'s 1,000 largest companies, with 60% having 1,000 or more employees. Over 75% employ IBM mainframe computers and 50% use other mainframes. The main businesses of the respondents, when given, are shown in Table I.

Among the companies that could count their installed base of personal computers, almost 17% found more than 30 installed.

Note, however, the "could count" caveat. Most companies do not know with

More than 67% of the corporate users surveyed have no guidelines for personal computer use.

absolute certainty the actual number of PBCs they have paid for, let alone the users or uses to which they are applied. The numbers given (see Table II) may therefore be on the low side.

APPLE MOST POPULAR

Which are the preferred brands? At present, the Apple is by far the most popular; almost 70% of those responding to this question use at least one Apple, and most listed multiple installations. Predictably, Radio Shack came in second, with over 40% employing TRS-80 models. Third in popularity was the IBM Personal Computer; we feel that the 30% that listed IBM included a significant number of machines that are on order. All other brand names were mentioned in far less significant numbers (see Table III). By next year, however, this overall complexion of brand preference should change, with IBM gaining a higher market share and other vendors such as DEC and Wang joining the list.

Participants were asked to name the highest and lowest level of employee presently using a PBC. In the lowest-level category, the professional employees—managers, programmers, financial analysts, and technical and accounting staff—were mentioned almost 44% of the time (see Table IV). Nonprofessionals were cited by 27%.

In the highest-level category (Table V), middle management was mentioned most frequently with 39%, followed by upper management with almost 33% and professionals with 7.5%.

As for the uses to which these workers are applying their computers, almost 80% are found to be performing financial calculations (see Table VI). VisiCalc and its "Visiclones" are also probably represented in the 21% used for marketing applications.

Nearly 40% of the respondents said that PBCs are supported as terminals on a mainframe. This information is displayed in Table VII, along with the answers to two related questions:

- Are file transfers permitted from the mainframe to personal computers?
- Is database updating permitted from the personal computer?

Mainframe/PBC file transfers occur in nearly a third of the companies, with an additional 14.7% planning to permit them in the future. On the question of database updating, the nays were more resounding. Over three quarters of the companies do not allow database updating from PBCs, and only 5% plan to permit it in the future. The negatives may represent the large amount of off-line, departmental work currently done on PBCs, rather than a firm bias against the practice.

A mere 8% of the corporate respondents indicated that firm guidelines governing the acquisition of PBCs were in place (see Table VIII). Only 24% reported that informal rules were being applied toward the purchase of PBCs on an experimental basis. That leaves about 67% of the present PBC corporate users surveyed with no guidelines or procedures in place. And, of this number, only 36% stated intentions to implement guidelines. Thus, it looks like the free-for-all market for personal computers in the office environment will exist for some time to come.

THE APPROVAL CYCLE

Although corporate-wide policy towards PBCs is still unclear, the respondents did indicate that some department was involved in the approval cycle. Not surprisingly, the dp department leads in this area, with nearly 55% of the responses stating that dp was involved in final approval (see Table IX). The individual user department, however, still has a good deal of autonomy, with 43% stating that approval rested there. The purchasing department came in a distant third with only 14% of the responses.

Multidepartment approval was involved in about 12% of the cases surveyed. In some companies, more than one approval is required or the end user has a choice in the purchasing source.

Rephrasing the question, participants were asked if the dp department had absolute approval or veto power over the acquisition of a personal computer. In at least one third of the companies surveyed the dp group does have such authority (see Table X).

The survey indicated a degree of confusion about setting policies, as well as a lack of planning, strategic or otherwise, in the implementation of PBCs as part of an overall information system. To complicate matters further, PBCs may function independent of any centralized dp facility as an executive work tool or gadget or, in the same environment, as nodes in a distributed network. Left unresolved at present are issues involving the overhead PBCs might place on such networks in their communicating modes; the compatibility of personal versus mainframe data or test files; the interfacing of personal computers in their own independent local networks; and the use of PBCs in local nets as office automation systems. With at least 1 million units expected to join the present PBC installed base over the next 12 months, now is the time to consider these issues and define some guidelines.

Amy Wohl is president and principal consultant of Advanced Office Concepts Corp., Bala Cynwyd, Pa., and a contributing editor of DATAMATION.

Kathleen Carey is a staff consultant and associate editor at ADC.

TABLE I

RESPONDENTS BY INDUSTRY TYPE

INDUSTRY	RESPONSES	
	NO.	%
Manufacturing	48	38.4
Government	17	13.6
Insurance	17	13.6
Education	16	12.8
Utility	14	11.2
Banking fiance	13	10.4
Total	125	100.00

TABLE II

INSTALLED PBCS

RANGES	RESPONDENTS	
	NO.	%
1-5	64	45.1
6-10	26	18.3
11-20	20	14.1
21-30	8	5.6
31 +	24	16.9
Total	142	100.00

TABLE III

PERSONAL COMPUTER BRANDS

VENDOR	RESPONSES	
	NO.	%
1. Apple	126	69.6
2. Radio Shack	72	41.4
3. IBM	57	31.4
4. Hewlett-Packard	15	8.3
5. Commodore	12	6.6
6. Health Zenith	9	5.0
7. Xerox	7	3.8
8. Atari	6	3.3
9. Osborne	5	2.7
10. Texas Instruments	5	2.7

*Based on 181 total responses, several respondents listed multiple vendors.

TABLE IV

LOWEST LEVEL OF PBC USERS

PROFESSIONAL	
POSITION	**TOTAL**
Manager	15
Programmer	14
Financial analyst	9
Technical	7
Accounting	6
Total	**51**
Percent*	43.6

NONPROFESSIONAL	
POSITION	**TOTAL**
Secretarial	14
Clerical	13
Sales	5
Total	**32**
Percent*	27.3

*Based on 117 total responses

TABLE V

HIGHEST LEVEL OF PBC USERS

UPPER MANAGEMENT	
Vice president	31
President	14
Ceo	5
Executive	2
Total	**52**
Percent*	32.7

MIDDLE MANAGEMENT	
Manager	36
Director	13
Financial advisor	9
Supervisor	4
Total	**62**
Percent*	39.0

PROFESSIONALS	
Consultant	3
Engineer	2
Programmer	7
Total	**12**
Percent*	7.5

*Based on 159 total respones

TABLE VI

APPLICATIONS

	RESPONSES	
	NO.	**%**
Financial	135	78.9
Word processing	63	36.8
Scientific	55	32.2
Marketing	35	20.5

*Based on 171 total responses: several respondents listed multiple applications.

TABLE IX

WHO APPROVES PBC PURCHASE?

	RESPONSES	
	NO.	**%**
Data processing	113	54.6*
Individual departments	89	42.9
Purchasing	30	14.4

*Based on 207 total responses. Several respondents listed multiple answers.

TABLE VII

PBCS AS TERMINALS

	TOTAL RESPONSES	YES		NO		PLAN TO	
		NO.	**%**	**NO.**	**%**	**NO.**	**%**
Supported now	199	76	38.2	123	61.8	0	0
File transfers allowed	156	49	31.4	84	54.0	23	14.7
Databased updating allowed	150	25	16.7	117	78.0	8	5.3

*Percentage of total responses for this function.

TABLE VIII

DO YOU HAVE A POLICY IN EFFECT NOW?

TOTAL RESPONSES	NO		YES		OTHER	
	No.	**%**	**No.**	**%**	**No.**	**%**
240	162	87.5	20	8.3	58	24.2

TABLE X

DP—ABSOLUTE APPROVAL OR VETO?

TOTAL RESPONSES	YES		NO	
	NO.	**%**	**NO.**	**%**
200	67	33.5	133	66.5

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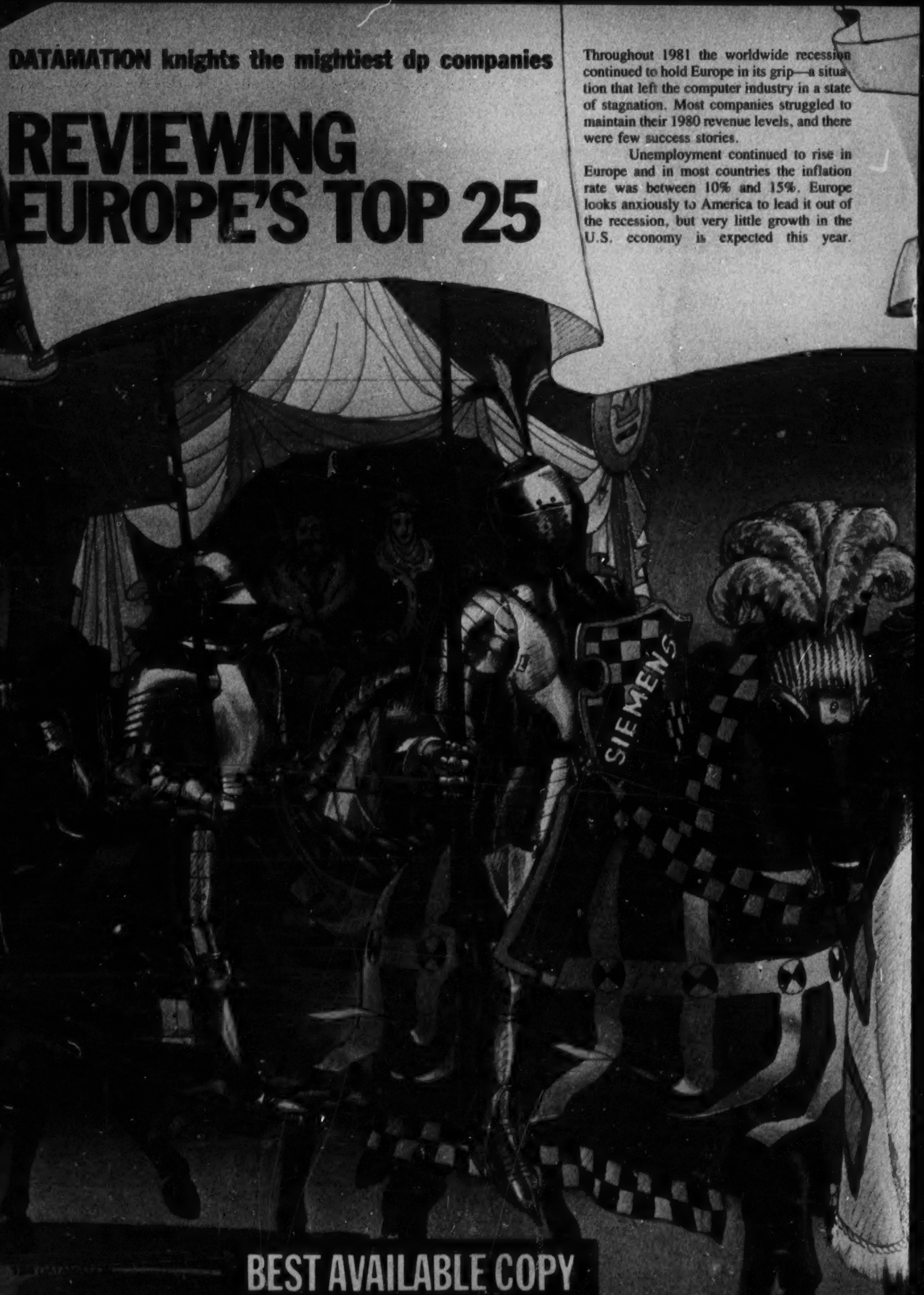
DATAMATION knights the mightiest dp companies

REVIEWING EUROPE'S TOP 25

Throughout 1981 the worldwide recession continued to hold Europe in its grip—a situation that left the computer industry in a state of stagnation. Most companies struggled to maintain their 1980 revenue levels, and there were few success stories.

Unemployment continued to rise in Europe and in most countries the inflation rate was between 10% and 15%. Europe looks anxiously to America to lead it out of the recession, but very little growth in the U.S. economy is expected this year.



"Reaganomics," which is restricting the money supply and keeping interest rates high, will offer no relief, it is predicted, until 1983.

Companies on both sides of the Atlantic have been hit extremely hard by exchange rate fluctuations. European currency values fell very sharply against the dollar during 1981, some by as much as 30%. This means that while European revenues may have shown good growth in terms of local currency, these same revenues were dismally lower when calculated in U.S. dollars.

IBM remains in an unassailable position at the top of the chart despite its poor performance in Europe. The company's proportion of the total revenues for the Top 25 in Europe dropped from 41% in 1980 to 37% in 1981. IBM's European revenues fell 6% despite a worldwide increase of 10%. It is obvious that IBM's growth is slowing down considerably, which is inevitable for a corporation of such size. IBM's net earnings also slumped between 1980 and 1981.

Although IBM still has a very strong hold on the top end of the market, large mainframe sales have become very sluggish. IBM made moves last year to improve its weak position at the lower end of the market, where industry growth is still impressive. IBM products are beginning to appear in retail stores, and the company has also enhanced its range of office products, personal computers, and small business systems.

IBM is currently facing up to the potential threat posed by AT&T's entry into the

ILLUSTRATION BY PONDER GOE

The leading European company in 1981 was Cii-HB.

information technology market. Ma Bell comes even higher than antitrust suits on IBM's list of priorities. Finally, after 13 years, the U.S. government's antitrust case against IBM has been resolved in the firm's favor. Now the giant company must turn its attention to the litigation brought against it by the EEC—litigation that seeks relief for the same practices that have been given a clean bill of health in the U.S.

TABLE I

TOP REVENUE GROWTH RATES IN U.S. $

		DP% GROWTH RATE*
1.	ITT	47
2.	DEC	38
3.	Wang	34
4.	Olivetti	15
5.	CIT Alcatel	13
	Univac	13
6.	Hewlett-Packard	8
7.	Datasaab	5
	Plessey	5
8.	Burroughs	1
	HIS	1

*European revenue, FY 1981

TABLE II

TOP REVENUE GROWTH RATES IN ACTUAL ACCOUNTING CURRENCIES

		DP% GROWTH RATE*
1.	Olivetti	52
2.	ITT	47
3.	DEC	38
4.	Wang	34
5.	CIT Alcatel	30
6.	Ferranti	29
7.	Datasaab	25
8.	Nixdorf	21
9.	Thomson-CSF	19
10.	Cii-HB	17

*European revenue, FY 1981

GROWING GRAPHICS MARKET

The fastest growing market in the dp industry at the moment is graphics, with some companies achieving revenue increases of 100% or more. The office automation arena is also showing very good growth at a current average of about 50% per annum. Although no microcomputer manufacturers have broken into Europe's Top 25, their entry should be imminent since growth in this sector continues at 50%. The previous spectacular growth of minicomputer makers has slowed to a steady 30%, but that is a good showing compared to most other large industry companies that have chalked up gains of only 10%.

The fastest growing companies in the European dp market are shown in Table I. As it was in 1980, this table is dominated by American companies. Comparing this table with last year's, it is especially noticeable that the overall market growth rate has slowed to virtually nothing. In 1980 ITT ranked last in our table with a growth rate of 24%. In this year's table the last place is jointly held by Honeywell Information Systems and Burroughs, both of which recorded a paltry 1% increase in revenues. The remaining companies maintained static or below par sales revenues. Against this generally gloomy picture, the growth of ITT, Digital Equipment, and Wang is quite spectacular, reflecting new trends in the market as well as new marketing strategies, particularly on the part of ITT.

Of course, when these companies' growth rates are calculated in terms of their own accounting currencies, Table I is transformed into Table II. Olivetti then shoots up to first place with a growth of 52%, due in part to its takeover of Logabax. Ferranti, Datasaab, Nixdorf, Thomson-CSF, and Cii-Honeywell Bull outdistanced most of their American rivals in terms of 1981 growth. To the extent that a company's overall health is measured in its accounting currency, this difference is very significant. For example, the 25% increase in Datasaab's revenue in Swedish kroner is the important indicator of its future, rather than the somewhat artificial 5% gain that results when its revenue is converted into U.S. dollars.

Nevertheless, 13 out of the Top 25 companies in Europe are American—the same proportion as last year. Together they account for 67% of the total revenues of all the Top 25 companies. If IBM is excluded, however, that percentage drops to 27%, showing that European companies have a strong, expanding Continental base.

Britain, France, and Germany each have three companies in the Top 25, while Italy, the Netherlands, and Sweden each have one. This accurately reflects the relative strengths of the dp industry in each of these European countries. It is unlikely that any other European nation will develop its computer industry sufficiently to produce a firm large enough to enter the Datamation Top 25 for some years to come.

IMPORTANT RANKING CHANGES

Several significant ranking changes have taken place since 1980. At the upper end of the table, DEC has moved up four notches from number eight to number four in Europe, knocking ICL into the fifth position. (ICL nevertheless achieved highest worldwide dp revenues of all the European companies.) Cii-HB and Siemens exchanged places, mainly due to a very poor year for Siemens. This means that in 1981 Cii-HB was the leading European company.

Philips, which had no official ranking last year because of the difficulty in obtaining exact dp revenue figures, has revealed itself this year to be a much more powerful force in the European dp world than a lot of people expected. Pegged in the ninth niche in 1981, Philips shows great promise of moving still higher in the future.

Meanwhile, ITT, with its 47% growth rate, has also made significant strides, jumping from 24th in 1980 to 17th last year.

The only true newcomer to the Top 25 list is Wang, which shows up in the 23rd slot now that word processing revenues are included in our definition for the DATAMATION Top 25. The entry of Philips and Wang means that two companies have been pushed off the bottom of the table—the French software house CISI and the American plug-compatible manufacturer Amdahl. Burroughs' complete takeover of Memorex and Datasaab's amalgamation with parts of its parent LM Ericsson portend some more dramatic changes in position for 1982.

Over the past year enormous changes have been wrought in the French dp industry as a result of the Socialist government's nationalization program. In the works since July 1981, the nationalization plans were finally approved last February. Negotiations on the details are likely to continue for a long time, and the reverberations from the nationalization effort on the European market as a whole are bound to affect the industry for some time to come.

The French government now has overall control of the three largest corporations that have electronics interests: Thomson-Brandt, with its subsidiary Thomson-CSF; Compagnie Générale d' Electricité (CGE), parent of CIT Alcatel; and Saint Gobain, with its affiliate Cii-Honeywell Bull. Honeywell's stake in Cii-HB has been reduced from 47% to 19%, and the government wants to take a 51% controlling interest from ITT in Compagnie Générale de Constructions Téléphoniques.

The past 12 months have been far from easy for those French companies caught up in the turmoil and uncertainties of nationalization. Even after the final nationalization

Around the world, 1981 was office automation year.

DATAMATION'S EUROPEAN TOP 25

1981 RANK	COMPANY	1980 RANK	PARENT COMPANY HQ	EUROPEAN DP REV. CAL. YR. 1981 (IN $ MIL.)	% CHANGE EUROPEAN DP REV. FY 1980/81 (IN $)	%CHANGE EUROPEAN DP REV. FY 1980/81 (IN ACCOUNTING CURRENCIES)	DP REV. DOMESTIC (PARENT CO.) FY 1981 (IN $ MIL.)
1.	**IBM**	1	U.S.	8,846	− 6	− 6	16,945
2.	**Cii-Honeywell Bull**	3	France	1,311	− 9	+17	754
3.	**Siemens**	2	W. Germany	1,296	−15	+ 4	*
4.	**Digital Equipment**	8	U.S.	1,162	+38	+38	2,631
5.	**ICL**	4	U.K.	1,067	−11	− 5	826
6.	**Olivetti**	5	Italy	1,006	+15	+52	*
7.	**Sperry Univac**[1]	6	U.S.	850	+13	+13	1,737
8.	**Control Data**	9	U.S.	765	+0.1	+0.1	*
9.	**Philips**[1]	n/a	Netherlands	750	*	*	*
10.	**Burroughs**	10	U.S.	742	+ 1	+ 1	2,037
11.	**NCR**	7	U.S.	728	−10	−10	*
12.	**Nixdorf**	11	W. Germany	678	− 4	+21	292
13.	**Hewlett-Packard**	12	U.S.	604	+ 8	+ 8	*
14.	**CIT Alcatel**	14	France	556	+13	+30	*
15.	**Honeywell Infor. Systems**	15	U.S.	497	+ 1	+ 1	*
16.	**Thomson-CSF**	13	France	460	− 7	+19	*
17.	**ITT**	24	U.S.	233	+47	+47	*
18.	**Rank Xerox**[1]	18	U.S.	219	−14	−14	467
19.	**Ferranti**	20	U.K.	213	+39	+29	*
20.	**Kienzle**	19	W. Germany	207	−0.5	+ 5	139
21.	**Datasaab**	17	Sweden	203	+ 5	+25	136
22.	**Plessey**[1]	16	U.K.	203	+ 5	+ 8	189
23.	**Wang**	n/a	U.S.	201	+34	+34	701
24.	**Data General**	22	U.S.	171	+0.6	+0.6	478
25.	**Memorex**[1]	21	U.S.	158	−10	−10	*

n/a Not applicable   *Not available   [1] Estimates

legislation was announced, it was still unclear what the government's industry plans would be. Under these circumstances, management has had little incentive to draw up strategy plans, and foreign customers have hesitated before buying their goods. U.S. and Japanese competitors did not miss this chance to make marketing inroads. The French firms, as a result, will have considerable ground to make up.

Back in the U.K. things were looking better for ICL at the end of 1981. In 1982 ICL is believed to be trading profitably and by 1983 it is expected to show an overall profit. The new management team of Rob Wilmott (managing director) and Chris Laidlaw (chairman) has breathed new life and dynamism into the old ICL, which seemed to have lost all motivation and sense of direction.

Significant changes have been made, including mass layoffs and plant closures, rationalization of product ranges, and deals with a number of manufacturers, notably Fujitsu, Three Rivers, Mitel, Sinclair, Rair, and Logica. These agreements are expected to fill in gaps in ICL's product line. Although ICL slipped into fifth position in the 1981 DATAMATION Top 25, it may well move back up the chart to join the leaders by 1983.

The merging of Datasaab with two divisions of its parent LM Ericsson to form Ericsson Information Systems (EIS) may signal the emergence of Sweden as a major power in the European dp industry. Revenues, coming mainly from office automation equipment and telecommunications expertise, could reach $550 million in 1982. This almost doubles Datasaab's previous sales figures and could mean a jump of several places in next year's DATAMATION Top 25 table.

As was true in 1980, no Japanese company has broken into the ranks of the European Top 25. Several European companies, such as ICL and Siemens, however, are selling Japanese mainframes under their own labels. Most of the Japanese manufacturers have set high export targets for the latter part of the 1980s. Nippon Electric (NEC) plans to be exporting 40% of its production—roughly $455 million worth—by 1985. Hitachi and Mitsubishi both hope for 10% in 1983. Fujitsu, the largest Japanese exporter, sells mainframes directly to Australia, Spain, and the Far East and indirectly in Europe through Siemens and ICL. It already sells subassemblies to Amdahl and will do the same for ICL for its Estriel machine. Fujitsu's 1981 exports totaled $264 million—13% of its output. Exports are expected to grow 30% to around $900 million in 1985. It is easy to predict that Japan Inc. will soon make an appearance in the DATAMATION Top 25—and apparently with an open invitation from most European manufacturers.

If 1982 is information technology year in the U.K., 1981 must have been office automation year around the world. The press was swamped with announcements from almost every major and minor manufacturer, detailing their electronic office strategies and plans. Despite the fact that very few of these announced products are likely to be automating anyone's office any time soon, enthusiasm was boundless and anyone without a publicized electronic office game plan was considered to be out of the race. The DATAMATION Top 25 celebrated this phenomenon with the entry of Wang into its ranking. Some

DP REV. WORLDWIDE FY 1981 (IN $ MIL.)	TOTAL REV. EUROPE FY 1981 (IN $ MIL.)	TOTAL REV. WORLDWIDE FY 1981 (IN $ MIL.)	% CHANGE IN TOTAL WORLDWIDE REV. 1980/81	TOTAL NET INCOME WORLDWIDE FY 1981 (IN $ MIL.)	% CHANGE TOTAL NET INCOME WORLDWIDE FY 1980/81	TOTAL WORLDWIDE EMPLOYEES	YEAR ENDING
29,070	8,846	29,070	+11	3,308	− 7	354,936	Dec.
1,352	1,311	1,352	− 9	− 79	−284	21,198	Dec.
1,330	10,917	15,854	−12	234	− 34	338,000	Sept.
3,198	935	3,198	+35	343	+ 37	66,000	June
1,513	1,134	1,513	− 6	−117	−392	24,625	Sept.
1,436	1,748	2,540	−0.2	*	*	53,471	Dec.
3,039	1,737	5,427	+ 8	*	*	*	Mar.
3,101	765	4,163	+ 9	171	+ 13	60,627	Dec.
*	9,500	16,964	− 8	143	− 17	348,100	Dec.
3,405	742	3,405	+17	149	+ 82	66,900	Dec.
2,838	904	3,433	+ 3	208	− 19	65,000	Dec.
856	678	856	+0.1	18	− 57	14,760	Dec.
1,771	1,205	3,578	+15	312	+ 16	64,000	Oct.
*	1,711	1,976	+10	*	*	40,000	Dec.
1,634	985	4,925	+ 9	259	− 10	29,000	Dec.
*	'2,521	*	*	*	*	8,350	Dec.
528	9,700	23,200	− 3	677	− 10	324,000	Dec.
817	2,332	8,691	+ 6	598	+ 6	120,981	Dec.
249	555	634	+35	38	+ 78	6,153	Mar.
217	402	402	+0.5	*	*	8,700	Mar.
231	203	257	− 7	*	*	3,550	Dec.
301	1,413	1,973	+21	130	+ 45	47,339	Mar.
856	172	856	+58	78	+ 50	15,700	June
737	167	737	+13	51	− 7	14,920	Sept.
452	243	695	−10	*	*	*	Dec.

estimates pinpoint word processor sales growth as high as 50%, and major companies such as IBM, Wang, Xerox, and Philips are likely to be the main beneficiaries.

METHODOLOGY

Information for the European Top 25 survey was solicited through a questionnaire. For the purposes of the survey, Europe was taken to include Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K. Dp and related activities were defined as covering the following product areas:

- *Mainframes*
- *Minicomputers and microcomputers—computers with a minimum of system software—and small business systems and personal computers*
- *Terminals and peripherals—all those connected, either directly or via data communications links, to a dp system*
- *Software and services: bureau services, database services, software packages, etc.*
- *Word processing equipment*
- *Data communications equipment, including data connections (modems and equivalent) and communications processors (multiplexors, concentrators)*

The following products were specifically excluded: general office equipment, electronic cash registers, electronic and magnetic card typewriters, instrumentation, dp supplies, and switching equipment supplied to PTTs for their data services.

The main ranking was based on 1981 calendar year revenues (in U.S. dollars) from dp operations in Europe for each company. Figures for companies whose fiscal year did not end December 1981 were adjusted, using published quarterly figures or estimates. All other figures appearing in this survey relate to the companies' reported results of their fiscal year ending 1981. In the main table, all results have been converted to U.S. dollars, using OECD exchange rate statistics for the appropriate time period. An additional column showing growth rates in actual accounting currencies has been included this year, due to the anomalies produced by fluctuating exchange rates.

While the 1980 ranking was correct, any inaccuracies uncovered in last year's table have been corrected and used for calculating the 1981 growth rates. Total revenue figures for Europe and worldwide refer to the parent company, where appropriate. When the parent company itself is not strongly involved in dp, the principal company has been considered as independent. Anomalies in the figures are inevitable since some companies do not give a revenue breakdown for the appropriate categories. Estimates were used for Sperry Univac, Plessey, and Rank Xerox because these firms did not provide answers to the survey questionnaire. ◆

DATAMATION's Top 25 survey was prepared by Logica, a London-based computer system and software house. Logica provides marketing consultancy services for the computer and communications industries such as the Eurodata Reports on data communications and Tarifica on communications facilities.

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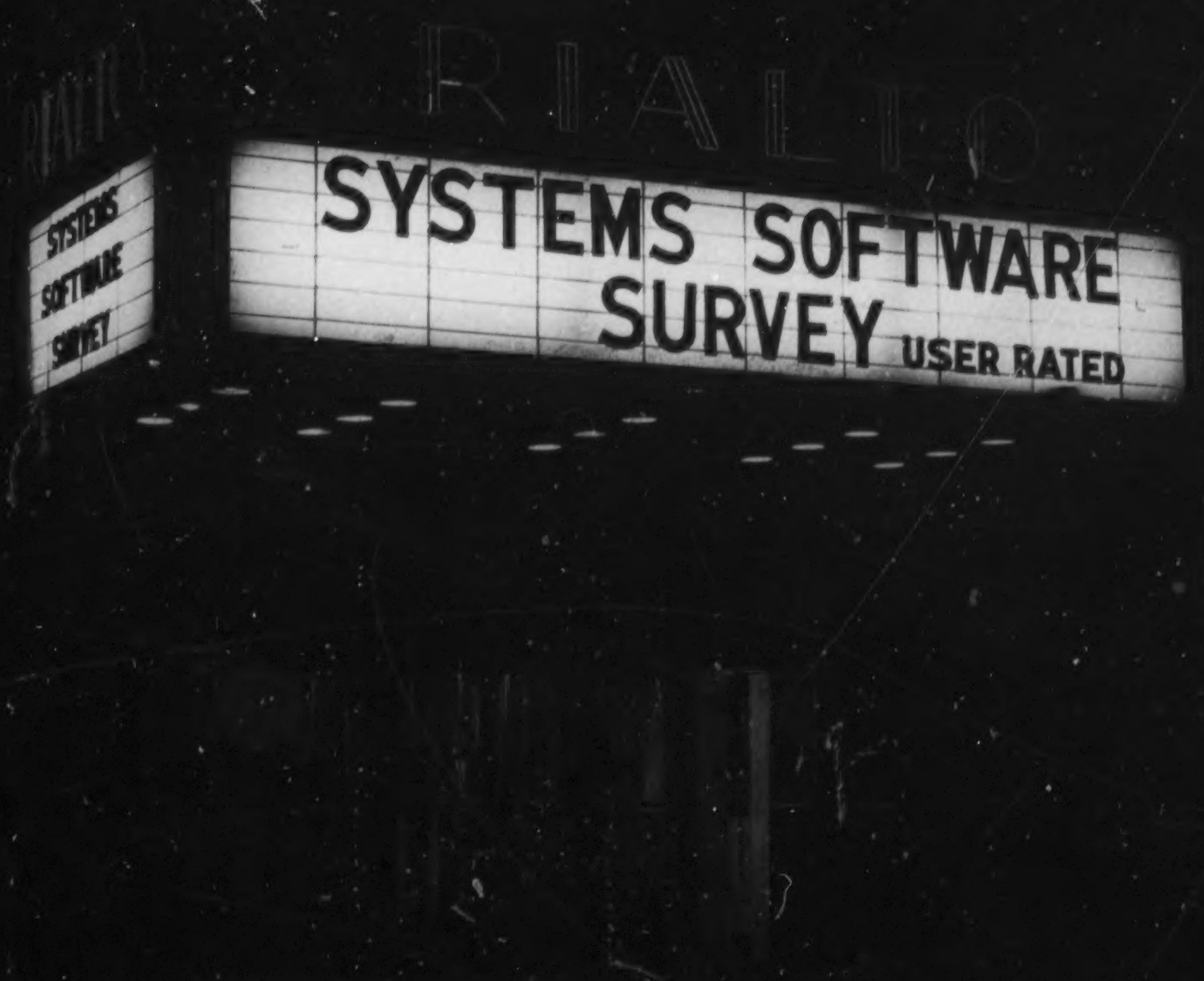
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INSIDE ATARI

MINICOMPUTER CAPACITY:
NOT ALWAYS WHAT IT SEEMS

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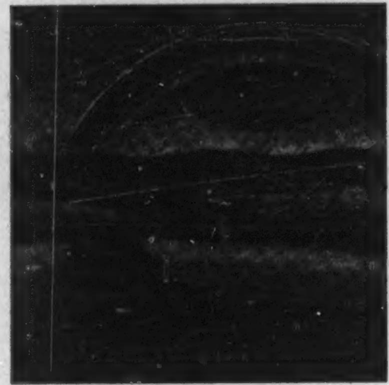

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COVER PHOTOGRAPH OF THE UNITED ARTISTS RIALTO THEATER, WESTFIELD, N.J., BY PETER ANGELO SIMON.

SYSTEMS SOFTWARE SURVEY

Over half of the 2,508 respondents rated their software packages as excellent values; another 40% said they were good values.

Data Decisions

.ve been looking for a new data- management package, something er than that tired old program ve been using for the last three s. You've got the selection down hree DBMS packages: they have ilar features, they're all compati- with your present software, the dors are top-drawer, and all three kages will take about the same to get up and running in-house.

With all three in such a close , how do you decide? You could go consultant for advice, but the last ple of recommended packages 't turn out to be as great as the sultant claimed. All three vendors a benchmark figures that look t, but your setup is just different ugh so you can't put much faith in e numbers. And even though ve had great success with systems kages from two of the vendors, do you know if their DMBS pack- are equally good?

A great many of your counterparts all over the country use DATAMATION's software ratings to help them choose packages, which is why our software surveys—systems packages in the winter, applications packages in the spring—are as popular as the DATAMATION Top 100 and salary survey.

This report presents the results of a nationwide survey of systems software users. The survey was conducted between Sept. 1 and Oct. 8, 1982 by Data Decisions, Cherry Hill, N.J. It was addressed to 8,239 users of 98 software packages installed at 6,267 sites. The selection of packages was based on a databank of known sites developed and maintained by Computer Intelligence (CI) Corp., a sister company of Data Decisions. All packages identified by CI as installed at 30 or more sites were included. The nature of the CI files permitted Data Decisions to direct the questionnaires to known users of each qualifying package.

The survey consisted of a first-class mailing of letter-questionnaires with postage-paid response envelopes. Users of packages with response rates of less than 40% of their site counts were interviewed by phone. These procedures yielded a total of 3,527 responses, for an overall response rate of 43%. The 3,527 responses included 1,019 respondents who indicated that the package was no longer installed at their sites. The final statistical base count was therefore 2,508 responses for current active users of the surveyed systems software packages. The net product of these numbers, in terms of the survey statistics, is that every surveyed package is represented by responses from at least 15 active users, and in most cases by substantially more; 10 packages that were each reported to be installed at fewer than 15 sites were excluded from the survey tabulations.

Statistics vs. "Hot" Packages

One use of a survey such as this is to help prospective users by presenting the collective opinions and experiences of users who are working with

About 80% of the users said software features and functions were a major influence in buying packages.

the packages. The value of these experiences and opinions is directly related to the sample size. As long as the quality of the sample items is good and consistent, the validity of any survey's results is strictly a function of the sample size relative to the size of the sample universe.

To meet established standards for statistical validity, Data Decisions set a lower limit of 15 active-user responses. Since a response rate of 40% to 50% was anticipated, this limit initially excluded many packages listed in the CI file with site counts of less than 30, and it later excluded additional packages for which responses totaled less than 15. Given these restrictions, the surveyed universe was naturally populated, in part, by older packages whose importance to the acquisition-minded vintage 1982 user may be marginal. Conversely, several recent state-of-the-art packages had to be excluded because their site or response counts were too low to yield statistically useful results. This is unfortunate, of course, because these packages are also important, or at least very interesting, to any user assembling a system.

The goal of this survey is to present users' evaluations of systems software for the majority of readers, who are concerned primarily with proven products whose utility and reliability have been well established. To be meaningful, this kind of evaluation needs a strong statistical foundation. To those readers who do not find their favorite packages in this survey, we apologize for our conservatism. But for those who are looking for proven products, that same conservatism contributes to the credibility of the evaluations.

Questionnaire

Users were asked to rate a specified systems package with respect to stated features, functions, and performance criteria. Four types of questions were asked. One type required only a yes or no response. The second asked users to select a phrase or phrases that defined the how, why, or other criteria of software performance. The third type weighted user responses on a simple three-part scale. The fourth and most specific type required the user to assign a performance rating based on a scale ranging from 10 to 9 for "superior" down to 2 or 1 for "inadequate" in relation to characteristics concerned with package use and operation, vendor service, and overall satisfaction.

Results and Conclusions

A synthesis of the responses from 2,508 active users of systems packages showed the following:

Buying Influences. Several factors influenced the acquisition process. For the average package, 80% of the users indicated that software features and functions were a major influence; 74% stated that compatibility with existing installed software was of major importance; 44% considered the overall "presence" or reputation of the software vendor important; and 45% rated the costs and time associated with modifying and implementing the software in-house a major influence in acquiring the systems package. On the other hand, 81% of the users indicated that recommendations from third parties or consultants were of minor or no import. In addition, 78% cited the results of benchmark runs as having little or no influence, and 70% cited experiences with other packages from the same vendor as having minor or no impact.

Alternate Packages. Overall, 48% of the users of the average package studied stated that they had evaluated alternative packages before making an acquisition decision. Such evaluations ranged from a high of 73% for users of telecommunications monitors to a low of 29% for users of the average report writer.

Computer Systems. The average systems package was installed on the following medium to large mainframes: IBM, 76%; Burroughs, 8%; Amdahl, 4%; NAS/Itel and Sperry Univac, 3% each; DEC, Hewlett-Packard, Honeywell, and Magnuson, 2% each; Control Data, 1%. (Because some packages are run on more than one system at a given site, the total adds up to more than 100.)

Time Installed. The average package installation period was 45 months. At the extremes of the response, 7% of the packages had been installed for less than a year and 5% for more than eight years. The survey, therefore, samples a very mature base of systems software users.

Maintenance. An overwhelming 87% of the packages were supported by the software vendor. Only 5% of the respondees employ a third-party support organization and 6% use in-house staff support.

Package Value. When users were asked to characterize the value of the features and capabilities of the average systems package, the following results were obtained:

- •34% Excellent Value—outstanding features and capabilities at prices comparable or below competitive software;
- •19% Excellent Value—good features and capabilities at prices substantially below competitive software;
- •8% Good Value—outstanding features and capabilities at prices higher than competitive software;
- •30% Good Value—good features and capabilities at prices comparable to competitive software;
- •2% Good Value—important features and capabilities are missing but prices are below those of competitive software;
- •1% Poor Value—good features/capabilities, but prices above competitive software;
- •2% Poor Value—important features and capabilities are missing and prices are comparable to or above competitive software.

Replacements. Only 15% of the users of the average package indicated that they were actively considering its replacement. Of this number, only 11% (or 2% overall) characterized the package as generally unsatisfactory, and only 10% (2% overall) stated that slow execution speed was the reason for replacement. The main reason cited for considering replacement for 37% (6% overall) was the need for features not presently incorporated into the package; 26% (4% overall) cited system upgrades where the new host and/or operating system would be incompatible with the package.

Performance vs. Promise. In one of the study's most interesting findings, an overwhelming 89% of the users stated that the package they rated either exceeded or met all vendor promises with respect to installation time, features and capabilities, performance, speed, and efficiency. Only 2% of the users said that vendor promises had not been met with regard to any of these factors.

Overall Satisfaction. Users were asked to state their overall satisfaction with the package on a superior (10 to 9), very good (8 to 6), acceptable (5 to 3), and inadequate (2 to 1) scale. Among users of the average package, 28% rated the product as superior in meeting or exceeding most requirements and 54% rated it as very good in meeting or exceeding most requirements. A total of 16% rated overall satisfaction as acceptable (the product met many requirements), while 2% rated overall satisfaction as inadequate (it met few requirements).

Package Groups

User responses have been grouped into these seven topic areas for more meaningful averaging and comparison among products:

- •Database Management Packages
- •Report Writers
- •Telecommunications Monitors
- •Other Communications Packages
- •Operating Systems/Systems Support Packages
- •Systems Management Aid Packages
- •Programming Utility Packages

Group and Package Ratings

The following list highlights the overall satisfaction ratings for the seven systems software groups studied. Also included are the ratings achieved by the individual packages in each group. The mean user ratings relate to a superior (10 to 9), very good (8, 7, or 6), acceptable (5, 4, or 3), and inadequate (2 or 1) rating scale. For each group, the ratings are presented in numerical order from

An overwhelming 89% of users said the package they rated either exceeded or met all vendor promises.

highest to lowest. Complete graphic presentations on all group packages are included in the bar charts that accompany this report.

DATABASE MANAGEMENT PACKAGES—21 packages studied.
Mean Score
8.4—SAS SAS
8.2—SSS Quick Job II
8.0—Burroughs CANDE, Pansophic Easytrieve, Software AG ADABAS
7.9—Cullinane IDMS
7.8—Hewlett-Packard Image/Query
7.5—Burroughs DMS II
7.4—Honeywell DM-IV
7.2—Group Average, ADR Datacom/DB
7.1—UCC UCC-TEN
7.0—Mathematica RAMIS II, Univac DMS
6.9—DEC Datatrieve
6.8—IBM IMS
6.7—IBM DL/1, IBM VSAM
6.6—Univac IMS
6.2—Intel System 2000
6.1—Cincom Total
5.7—Burroughs Forte

REPORT WRITERS—9 packages studied.
Mean Score
8.3—Hewlett-Packard View
8.2—Dylakor DYL 260, Dylakor DYL 280
8.0—Visicorp VisiCalc
7.7—Group Average
7.6—Burroughs ODESY
7.5—Cullinane Culprit/Auditor, On-line WYLBUR
7.0—IBM BRADS II/BRADS III
6.7—Burroughs Reporter

TELECOMMUNICATIONS MONITORS—10 packages studied.
Mean Score
7.9—Westinghouse Westi
7.4—Altergo Shadow
7.1—IBM CICS
7.0—ADR Datacom/DC
6.7—Mathematica MPGSWIFT
6.6—Group Average, Software AG Complete
6.4—SDA Intercomm
6.3—SDA Minicomm
5.4—Cincom Environ/1
4.8—TSI Task/Master

OTHER COMMUNICATIONS PACKAGES—14 packages studied.
Mean Score
8.3—IBM HASP
8.2—ADR VOLLIE
7.7—Burroughs NDL, Compuware Abend-Aid, IBM JES 3
7.4—ADR Roscoe
7.3—Burroughs GEMCOS, IBM TSO
7.2—Group Average
7.0—IBM CMS, IBM JES 2, IBM VTAM
6.6—IBM NCP
5.9—IMB ICCF, IBM MTCS

OPERATING SYSTEMS/SYSTEMS SUPPORT—26 packages studied.
Mean Score
8.9—Goal FAQS
8.8—Software Pursuits DOS/MVT
8.7—Syncsort Syncsort
8.6—Goal FLEE/FLIM
8.4—Computer Associates CA-Sort, Innovation FDR
8.3—Westinghouse DOS/Dump-Restor
8.2—Pansophic Panvalet
8.1—Altergo Space/Manager, IMSL Library-SYS
8.0—UCC UCC-ONE
7.9—IBM Utility
7.8—Cambridge Systems ASM2
7.7—Group Average
7.6—Capex TLMS, IBM Power, NCI Slick
7.4—ADR Librarian
7.3—Tower DFAST, Tower TFAST
7.2—SPSS SPSS
7.0—Computer Associates DYNAM/D
6.8—Universal ADAS
6.7—Computer Associates DYNAM/T, UCC UCC-Three
6.2—SDI EPAT
5.5—Value Valu-Lib

SYSTEMS MANAGEMENT AIDS—14 packages studied.
Mean Score
8.7—Candle Omegamon
8.3—Capex Plan IV
7.9—Cambridge Systems ACF2
7.8—ADR Look, Foresight Foresight
7.7—Boole & Babbage Resolve
7.6—IBM Ditto
7.2—Group Average
7.0—Johnson JARS, UCC UCC-15
6.9—Westinghouse Job Monitor
6.7—Computer Associates Jasper
6.3—Pace Komand
5.9—Value Comput-a-Charge
5.5—IMB DMS

PERSONNEL
TODD

"We're looking for an aggressive, tenacious salesperson, like, for instance, the one who sold you that suit."

©DATAMATION

CARTOON BY LEONARD TODD

PROGRAMMING UTILITIES—4 packages studied.

Mean Score

8.1—Capex Optimizer
7.6—UCC UCC-Two
7.5—Group Average
7.4—NCI Owl
6.8—Informatics Mark IV

Rating Bars

The following bar charts provide a graphic representation with respect to questions on overall satisfaction, installation and initial use, vendor service and support, and operations criteria. Graphs are presented for all 98 systems software packages that were sampled.

Bar charts are also included for both the total survey and for the individual systems software group averages. Additional information included with each bar chart cites the total number of responses, the number of users rating the package as outstanding, the number actively considering replacing the package for any reason, and the number seeking replacement for generally unsatisfactory performance. The bar charts show ratings of superior (10 to 9), very good (8 to 6), and acceptable (5 to 4). Ratings under 4 are not graphed.

The *Overall Satisfaction* bar encompasses factors such as satisfaction with package features, capabilities, and utility with respect to user requirements; the frequency of failures requiring extra effort for recovery; and vendor installation, documentation, modification, and training support.

The bar labeled *Installation and Initial Use* represents a composite that includes freedom from bugs/errors; time required for initial installation; ease of implementation; and quality of documentation and training.

The bar labeled *Vendor Service* gauges the vendor's speed and thoroughness in fixing bugs/errors, the quality of vendor program modifications, and the frequency of package updating.

The *Operations* bar is a measure of the package's ability to handle expanding processing volumes and an evaluation of initiation/calling and backup/recovery procedures.

Special note: in split bar presentations, the solid bar indicates the package's scores; the open bar denotes the common group average.

This systems software survey is based on a forthcoming report in Data Decisions' Software Service, a loose-leaf monthly updated reference service covering systems and applications software. A trial review is available from Data Decisions, 20 Brace Rd., Cherry Hill, NJ 08034; (800) 257-7732; in New Jersey, (609) 429-7100.

AV. TOLERANCES FOR 68% CONFIDENCE LEVEL

	OVERALL SATISFACTION			SPECIFIC ATTRIBUTE RATINGS			
SAMPLE SIZE	6.0 or Under	7.0	8.0 or Over	6.0 or Under	7.0	8.0	9.0 or Over
40 or more	.25	.25	.20	.30	.30	.25	.20
30 to 39	—	.30	.25	.35	.30	.30	.20
25 to 29	.45	.35	.30	.40	.40	.30	.25
20 to 24	.45	.35	.30	.45	.40	.35	.25
15 to 19	.50	.50	.35	.50	.50	.40	.30

Table Reads: The chances are approximately two in three that a reported rating differs by no more than the indicated tolerance from the rating that would have been obtained had all eligible sites been enumerated. For example, suppose a sample of 30 sites gives a software package rating of 7.0 for Overall Satisfaction. The table indicates a tolerance of .30 on this estimate. Thus, the chances are two in three that the interval 6.70 to 7.30 includes the rating that would have been obtained had all eligible sites been enumerated.

METHODOLOGY

Universe and Sample

Because the focus of the study was on users' perceptions of specific systems packages, the sample was selected from a universe of known users of each package. A list of installations maintained by Computer Intelligence Corp., La Jolla, Calif., was the sample source. For systems packages in use at more than 100 installations, a sample of 100 names was selected on an "nth" name basis. For packages in use at 100 or fewer installations, an effort was made to collect data from all known users of the package. Packages installed at fewer than 30 sites were excluded from the survey.

Mailing

In total, 8,239 questionnaires were sent to known users of 98 different software packages at 6,267 sites. Questionnaires were addressed to a specific individual at the location—most often the data processing manager. A sweepstakes offer for a trip to London was included with the mailing to stimulate response.

A total of 2,659 questionnaires from 2,023 sites were returned; 38 questionnaires, addressed to 29 sites, were undeliverable by the post office. To increase the overall response rate and ensure an adequate response base for each individual package, telephone interviews were conducted among those who did not respond to the mail survey. The questionnaire used in the telephone interview was identical to that used in the mail survey.

The sample for the telephone interviews was selected to provide a minimum 40% response for each systems package included in the survey. A total of 868 telephone interviews were completed. This brought the total number of survey responses to 3,527, for a 43% response rate. Included in the 3,527 responses were 1,019 respondents who indicated that the specific package was not currently in use at their installations.

Questionnaire

The survey questionnaire on which this report is based first qualified the respondent as a user of the specific package being discussed and then explored various dimensions of the package's acquisition and use:

- The environment in which the package is used, including length of time installed, how it is supported, and host computer;
- The purchase process, including whether alternative packages were considered before the purchase and how the perceived importance of selected factors affected the buyers' decisions;
- Users' ratings of the package on nine features covering package installation, initial use, service, and operations. A 10-point scale was used in all questions along with verbal guides to augment the numerical values: 10 and 9 were identified as superior; 8, 7, and 6 as very good; 5, 4, and 3 as acceptable; and 2 and 1 as inadequate;
- Users' perception of the value of the package, with value defined as the package's capabilities and features relative to those of competitive packages and to competitive package costs;
- Whether users are considering package replacement, and if so, why;
- Users' overall evaluation of the package, including the extent to which performance met or exceeded vendor promises, and overall satisfaction with the package.

Findings

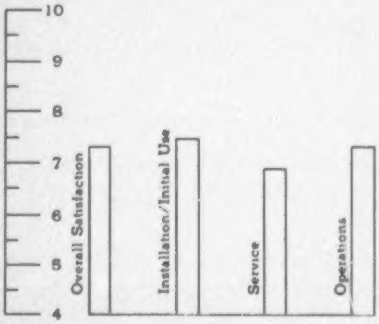
The findings presented in this report reflect user perceptions of package performance in response to the dimensions probed in the survey questionnaire. These are not intended to be all-inclusive, nor do they necessarily produce evaluations comparable to those that would be obtained under conditions of a controlled engineering test or experiment.

As in all sample surveys, the numbers reported are estimates within a range of what would have been obtained had all user sites in the survey universe been similarly enumerated. The margins of sampling variation or tolerances applicable to ratings of individual aspects of performance are given in the table.

■ OVERALL SUMMARY

Average—All Packages ● 98 packages

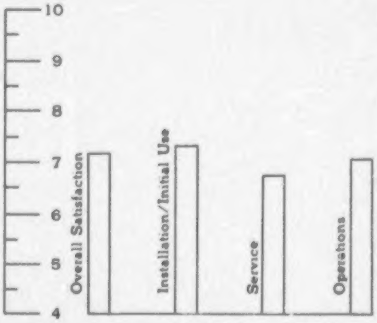
2,508 responses ● 41% judge features/capabilities outstanding ● 15% considering replacement, 2% due to unsatisfactory performance.



□ DATABASE MANAGERS

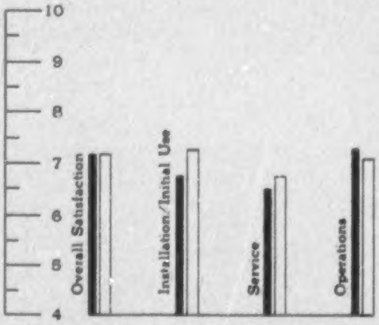
Group Average ● 21 packages

616 responses ● 40% judge features/capabilities outstanding ● 14% considering replacement, 1% due to unsatisfactory performance.



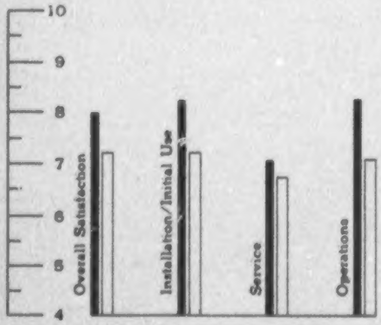
ADR DATACOM/DB ● Applied Data Research, Route 206 & Orchard Rd., Princeton NJ 08540 ● 201-874-9000

20 responses ● 40% judge features/capabilities outstanding ● 5% considering replacement, 0% due to unsatisfactory performance.



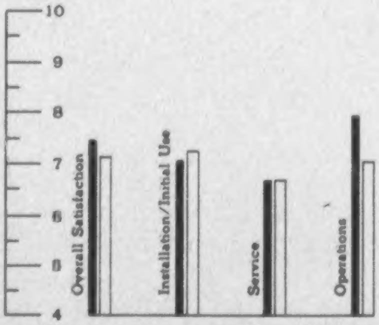
BURROUGHS CANDE ● Burroughs Corp., Burroughs Place, Detroit, MI 48232 ● 313-972-7000

41 responses ● 46% judge features/capabilities outstanding ● 2% considering replacement, 0% due to unsatisfactory performance.



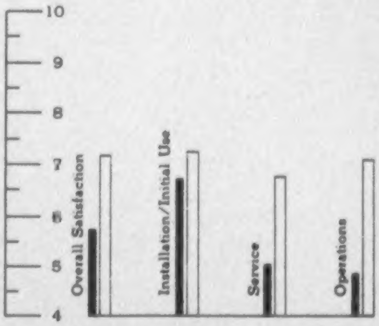
BURROUGHS DMS II ● Burroughs Corp., Burroughs Place, Detroit, MI 48232 ● 313-972-7000

41 responses ● 49% judge features/capabilities outstanding ● 12% considering replacement, 0% due to unsatisfactory performance.



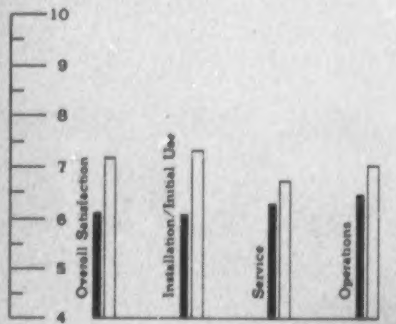
BURROUGHS FORTE ● Burroughs Corp., Burroughs Place, Detroit, MI 48232 ● 313-972-7000

27 responses ● 26% judge features/capabilities outstanding ● 78% considering replacement, 15% due to unsatisfactory performance.



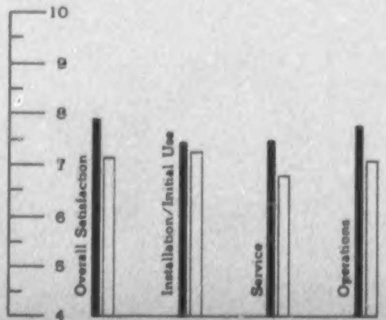
CINCOM TOTAL ● Cincom Systems Incorporated, 2300 Montana Avenue, Cincinnati, OH 45211 ● 513-662-2300

21 responses ● 29% judge features/capabilities outstanding ● 52% considering replacement, 10% due to unsatisfactory performance.



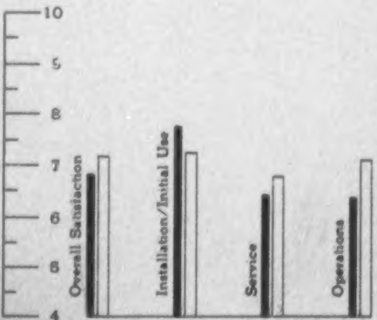
CULLINANE IDMS ● Cullinane Database Systems, 400 Blue Hill Drive, Westwood, MA 02090 ● 617-329-7700

28 responses ● 55% judge features/capabilities outstanding ● 3% considering replacement, 0% due to unsatisfactory performance.



DEC DATATRIEVE ● Digital Equipment Corp., 146 Main St., Maynard, MA 01754 ● 617-897-5111

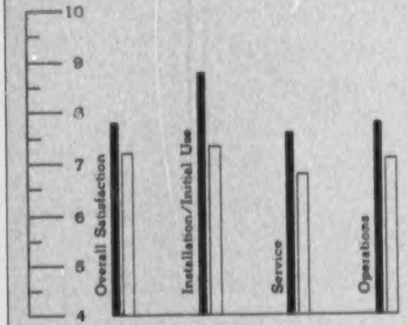
24 responses ● 29% judge features/capabilities outstanding ● 25% considering replacement, 0% due to unsatisfactory performance.



SYSTEMS SOFTWARE SURVEY

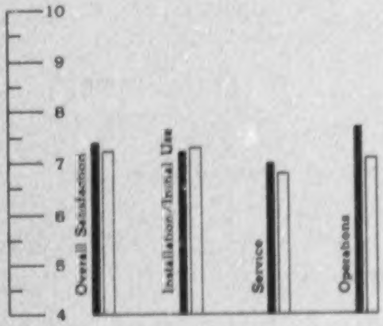
HP IMAGE/QUERY • Hewlett-Packard, Data Systems Division, 11000 Wolfe Road, Cupertino, CA 95014 • 408-257-7000

29 responses • 52% judge features/capabilities outstanding • 7% considering replacement, 0% due to unsatisfactory performance.



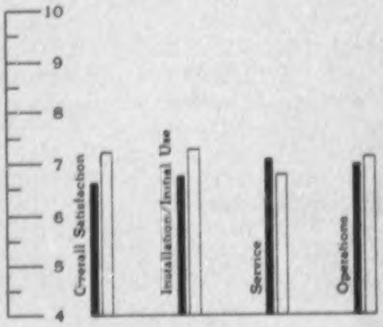
HONEYWELL DM-IV • Honeywell Information Systems, 200 Smith Street, Waltham, MA 02145 • 617-890-8400

23 responses • 52% judge features/capabilities outstanding • 0% considering replacement.



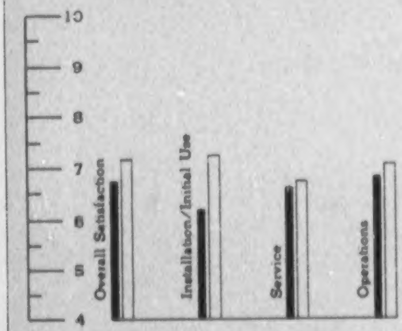
IBM DL/1 • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

30 responses • 23% judge features/capabilities outstanding • 3% considering replacement, 0% due to unsatisfactory performance.



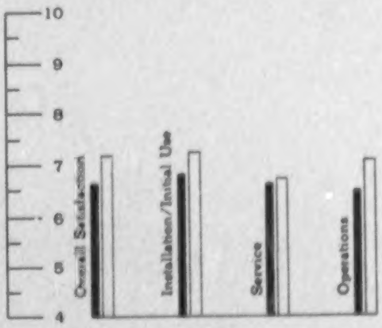
IBM IMS • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

15 responses • 40% judge features/capabilities outstanding • 13% considering replacement, 0% due to unsatisfactory performance.



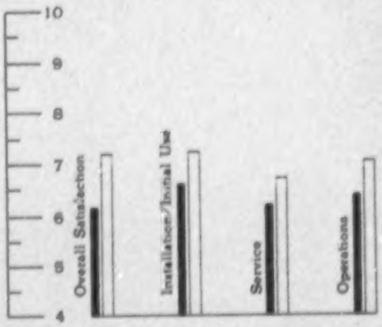
IBM VSAM • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

37 responses • 41% judge features/capabilities outstanding • 3% considering replacement, 0% due to unsatisfactory performance.



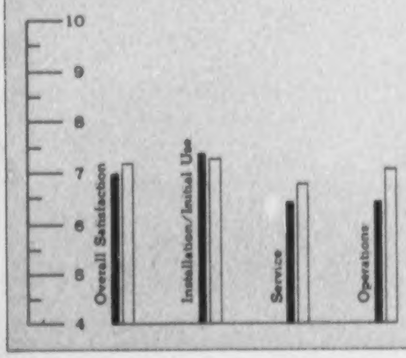
INTEL SYSTEM 2000 • Intel Systems Corp., 12675 Research Blvd., Austin, TX 78766 • 512-258-5171

24 responses • 38% judge features/capabilities outstanding • 25% considering replacement, 4% due to unsatisfactory performance.



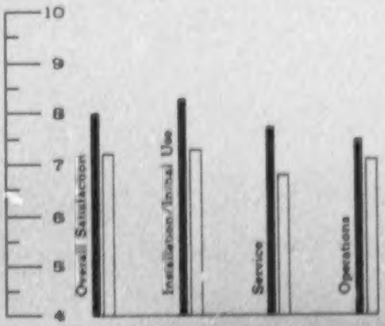
MATHEMATICA RAMIS II • Mathematica Products Group, P.O. Box 2392, Princeton, NJ 08540 • 609-799-2600

15 responses • 47% judge features/capabilities outstanding • 7% considering replacement, 7% due to unsatisfactory performance



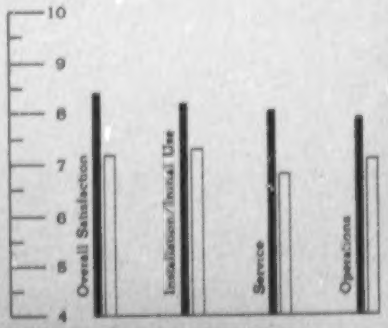
PANSOPHIC EASYTRIEVE • Pansophic Systems, Inc., 709 Enterprise Drive, Oakbrook, IL 60521 • 312-986-2260

32 responses • 44% judge features/capabilities outstanding • 6% considering replacement, 0% due to unsatisfactory performance.



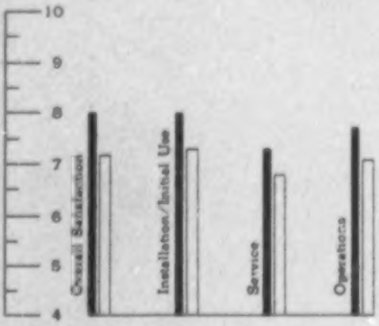
SAS SAS • SAS Institute, Inc. SAS Circle, Cary, NC 27511 • 919-467-8000

34 responses • 50% judge features/capabilities outstanding • 0% considering replacement.



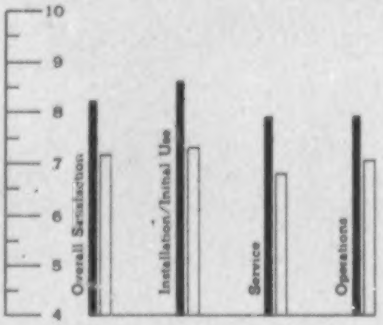
SOFTWARE AG ADABAS • Software AG Systems Group • 11000 Sunrise Valley Drive, Reston, VA 22091 • 703-860-5050

39 responses • 62% judge features/capabilities outstanding • 3% considering replacement, 0% due to unsatisfactory performance.



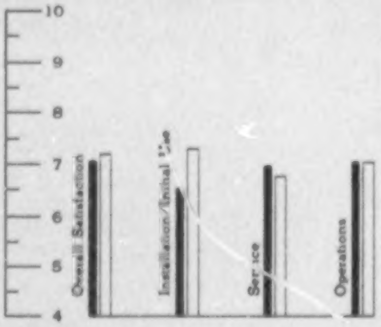
SSS QUICKJOB II • System Support Software, Inc., 5230 Springboro Pike, Dayton, OH 45439 • 513-435-9514

41 responses • 46% judge features/capabilities outstanding • 10% considering replacement, 0% due to unsatisfactory performance.



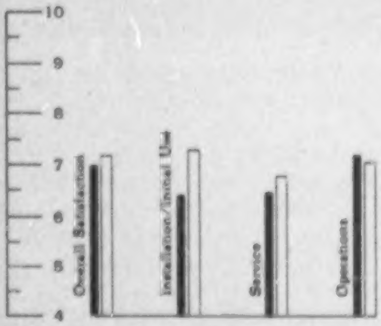
UCC UCC – TEN • University Computing Company, UCC Tower/Exchange Park, Dallas, TX 75235 • 214-353-7100

16 responses • 25% judge features/capabilities outstanding • 13% considering replacement, 0% due to unsatisfactory performance.



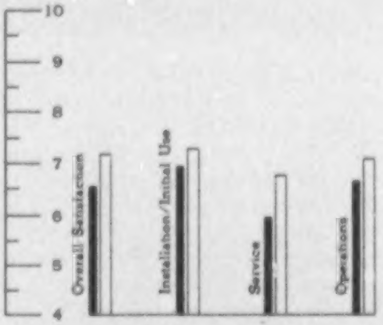
UNIVAC DMS • Sperry Univac Division, Sperry Corp., P.O. Box 500, Blue Bell, PA 19422 • 215-542-4011

37 responses • 35% judge features/capabilities outstanding • 8% considering replacement, 0% due to unsatisfactory performance.



UNIVAC IMS • Sperry Univac Division, Sperry Corp., P.O. Box 500, Blue Bell, PA 19422 • 215-542-4011

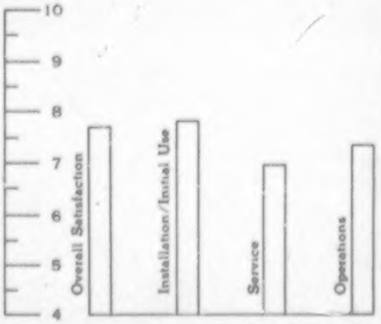
41 responses • 22% judge features/capabilities outstanding • 27% considering replacement, 0% due to unsatisfactory performance.



□ REPORT WRITERS

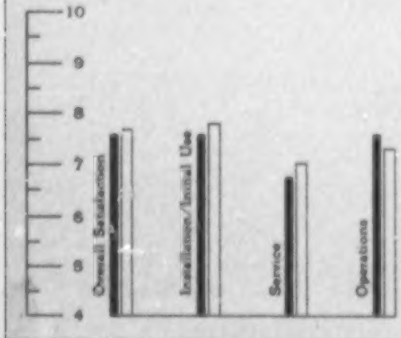
Group Average • 9 packages

246 responses • 46% judge features/capabilities outstanding • 13% considering replacement, 2% due to unsatisfactory performance.



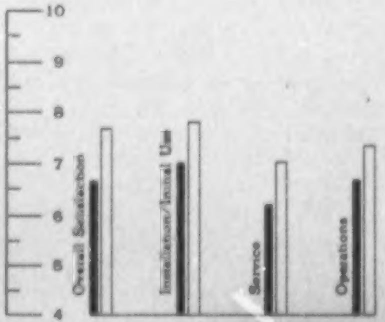
BURROUGHS ODESY • Burroughs Corp. Burroughs Place, Detroit, MI 48232 • 714-731-5100

29 responses • 34% judge features/capabilities outstanding • 17% considering replacement, 3% due to unsatisfactory performance.



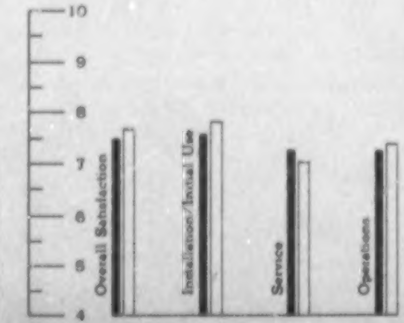
BURROUGHS REPORTER • Burroughs Corp. Burroughs Place, Detroit, MI 48232 • 714-731-5100

21 responses • 33% judge features/capabilities outstanding • 10% considering replacement, 5% due to unsatisfactory performance.



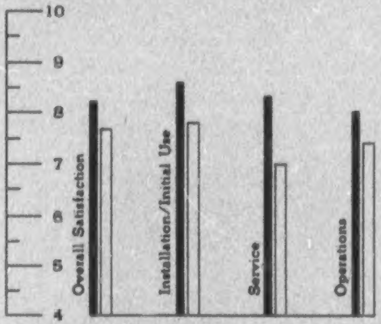
CULLINANE CULPRIT/AUDITOR • Cullinane Database Systems, Inc., 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

35 responses • 43% judge features/capabilities outstanding • 6% considering replacement, 3% due to unsatisfactory performance.



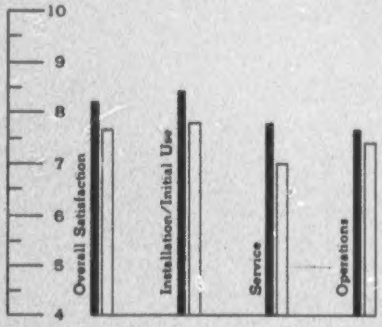
DYLAKOR DYL-260 • Dylakor, 17418 Chatsworth Street, Granada Hills, CA 91344 • 213-366-1781

31 responses • 61% judge features/capabilities outstanding • 10% considering replacement, 0% due to unsatisfactory performance.



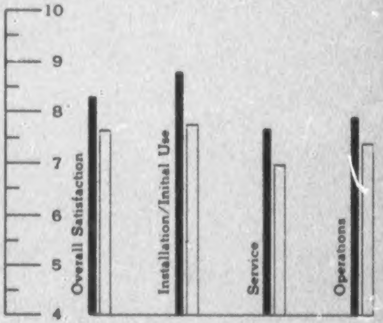
DYLAKOR DYL-280 • Dylakor, 17418 Chatsworth Street, Granada Hills, CA 91344 • 213-366-1781

30 responses • 39% judge features/capabilities outstanding • 5% considering replacement, 0% due to unsatisfactory performance.



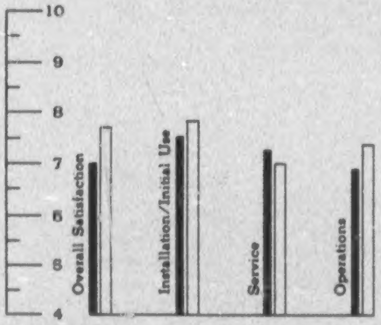
HP VIEW • Hewlett-Packard, Data Systems Division, 11000 Wolfe Road, Cupertino, CA 95014 • 408-257-7000

22 responses • 59% judge features/capabilities outstanding • 9% considering replacement, 5% due to unsatisfactory performance.



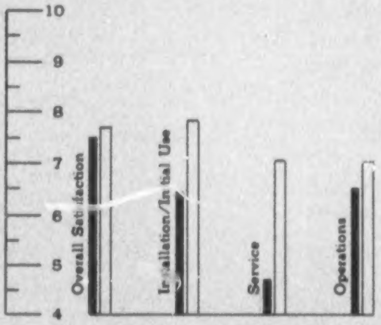
IBM BRADS II/BRADS III • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

15 responses • 46% judge features/capabilities outstanding • 0% considering replacement.



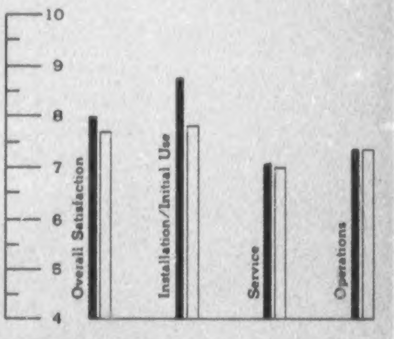
ON-LINE WYLBUR • On-Line Business Systems, Inc., 115 Sansome Street, San Francisco, CA 94104 • 412-931-7600

15 responses • 40% judge features/capabilities outstanding • 40% considering replacement, 0% due to unsatisfactory performance.



VISICORP VISICALC • VisiCorp, 2895 Zanker Rd., San Jose, C 95134 • 408-946-9000

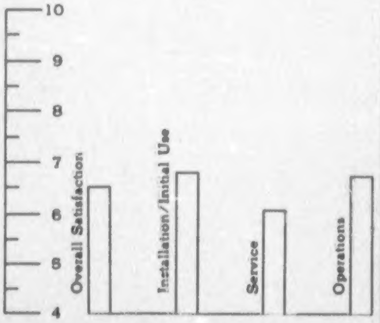
39 responses • 56% judge features/capabilities outstanding • 18% considering replacement, 0% due to unsatisfactory performance.



☐ TELECOMMUNICATIONS MONITORS

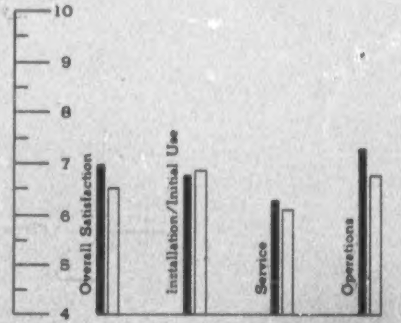
Group Average • 10 packages

206 responses • 32% judge features/capabilities outstanding • 37% considering replacement, 9% due to unsatisfactory performance.



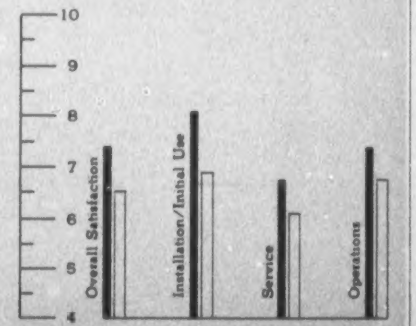
ADR DATACOM/DC • Applied Data Research, Route 206 & Orchard Road, Princeton, NJ 08540 • 201-874-9000

18 responses • 33% judge features/capabilities outstanding • 11% considering replacement, 0% due to unsatisfactory performance.



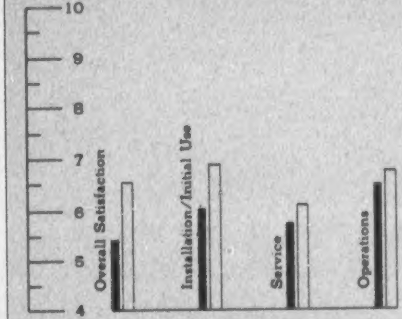
ALTERGO SHADOW • Insac Software, Inc., 2300 Peachford Road, Suite 3235, Atlanta, GA 30338 • 404-452-7676

34 responses • 38% judge features/capabilities outstanding • 32% considering replacement, 3% due to unsatisfactory performance.



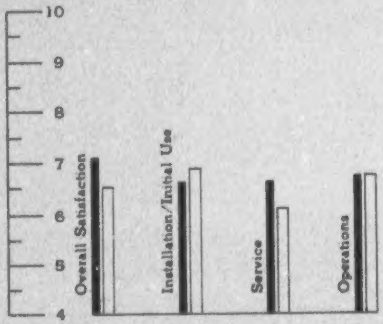
CINCOM ENVIRON/1 ● Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, OH 45211 ● 513-662-2300

26 responses ● 31% judge features/capabilities outstanding ● 46% considering replacement, 15% due to unsatisfactory performance.



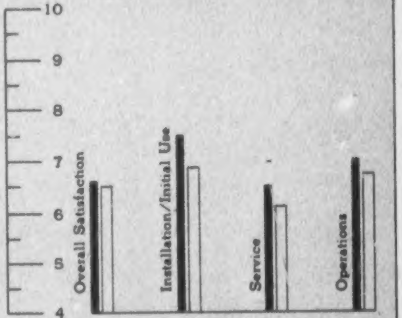
IBM CICS ● IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 ● 914-696-1900

21 responses ● 38% judge features/capabilities outstanding ● 0% considering replacement.



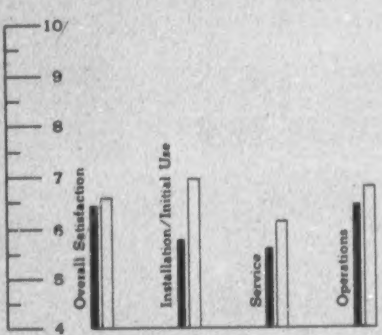
MATHEMATICA SWIFT ● Mathematica Products Group, P.O. Box 2392, Princeton, NJ 08540 ● 609-799-2600

15 responses ● 40% judge features/capabilities outstanding ● 40% considering replacement, 0% due to unsatisfactory performance.



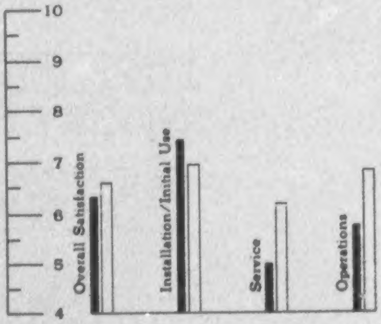
SDA PRODUCTS INTERCOMM ● SDA Products, Inc., 475 Park Avenue, 26th Floor, New York, NY 10016 ● 212-481-6800

17 responses ● 18% judge features/capabilities outstanding ● 35% considering replacement, 18% due to unsatisfactory performance.



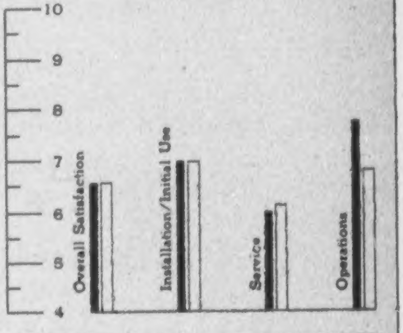
SDA PRODUCTS MINICOMM ● SDA Products, Inc., 475 Park Avenue, 26th Floor, New York, NY 10016 ● 212-481-6800

15 responses ● 13% judge features/capabilities outstanding ● 87% considering replacement, 13% due to unsatisfactory performance.



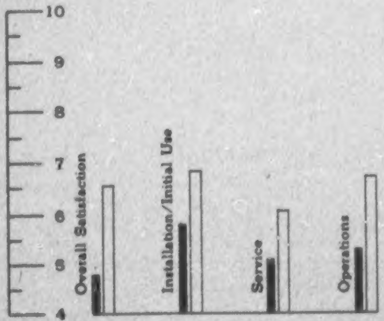
SOFTWARE AG COM-PLETE ● Software AG of North America, 11800 Sunrise Valley Drive, Reston, VA 22091 ● 703-860-5050

15 responses ● 47% judge features/capabilities outstanding ● 20% considering replacement, 13% due to unsatisfactory performance.



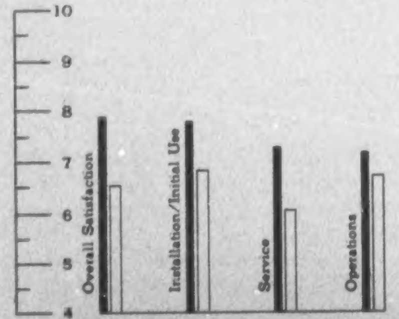
TSI TASK/MASTER ● TSI International, 50 Washington Street, Norwalk, CT 06854 ● 203-853-2884

19 responses ● 11% judge features/capabilities outstanding ● 63% considering replacement, 37% due to unsatisfactory performance.



WESTINGHOUSE WESTI ● Westinghouse Electric Corp., 2040 Ardmore Blvd., Pittsburgh, PA 15221 ● 412-636-3100

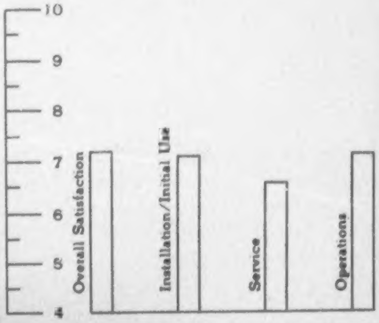
26 responses ● 46% judge features/capabilities outstanding ● 35% considering replacement, 4% due to unsatisfactory performance.



☐ OTHER COMMUNICATIONS PACKAGES

Group Average ● 14 packages

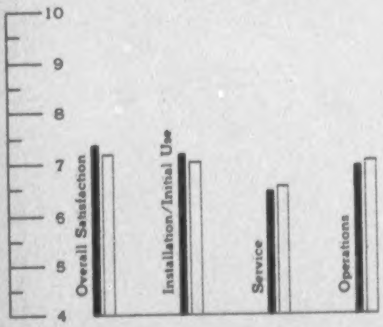
380 responses ● 44% judge features/capabilities outstanding ● 12% considering replacement, 2% due to unsatisfactory performance.



BEST AVAILABLE COPY

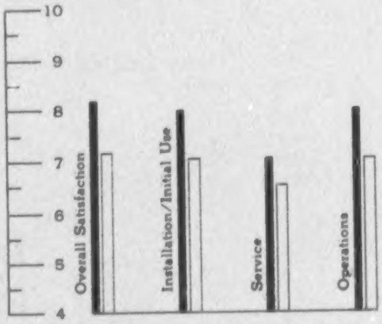
ADR ROSCOE • Applied Data Research, Route 206 & Orchard Road, Princeton, NJ 08540 • 201-874-9000

26 responses • 50% judge features/capabilities outstanding • 15% considering replacement, 0% due to unsatisfactory performance.



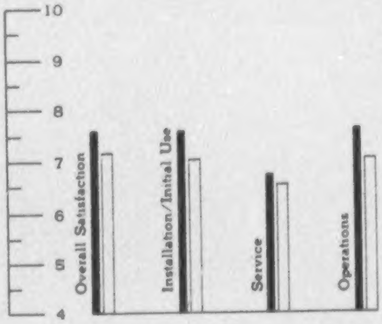
ADR VOLLIE • Applied Data Research, Route 206 & Orchard Road, Princeton, NJ 08540 • 201-874-9000

65 responses • 72% judge features/capabilities outstanding • 0% considering replacement.



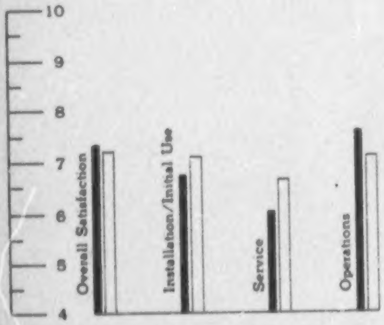
BURROUGHS NDL • Burroughs Corp. Burroughs Place, Detroit, MI 48232 • 714-731-5100

35 responses • 51% judge features/capabilities outstanding • 9% considering replacement, 0% due to unsatisfactory performance.



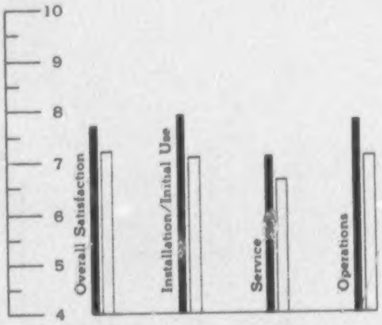
BURROUGHS GEMCOS • Burroughs Corp. Burroughs Place, Detroit, MI 48232 • 714-731-5100

27 responses • 41% judge features/capabilities outstanding • 4% considering replacement, 0% due to unsatisfactory performance.



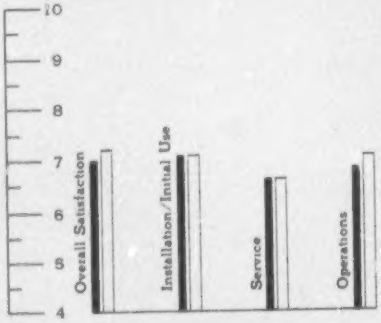
COMPUWARE ABEND-AID • Compuware Corp., 29433 Southfield Rd., Southfield MI 48076 • 313-559-0890

23 responses • 43% judge features/capabilities outstanding • 0% considering replacement.



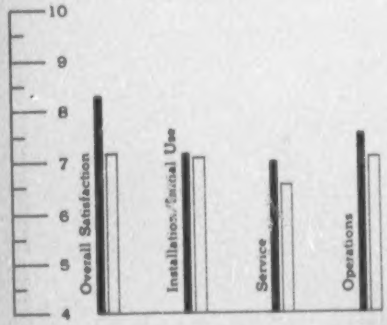
IBM CMS • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

20 responses • 60% judge features/capabilities outstanding • 5% considering replacement, 5% due to unsatisfactory performance.



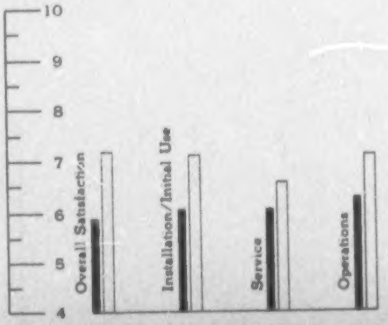
IBM HASP • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

20 responses • 30% judge features/capabilities outstanding • 40% considering replacement, 15% due to unsatisfactory performance.



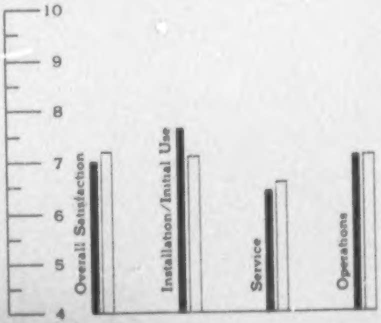
IBM ICCF • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

47 responses • 21% judge features/capabilities outstanding • 17% considering replacement, 9% due to unsatisfactory performance.



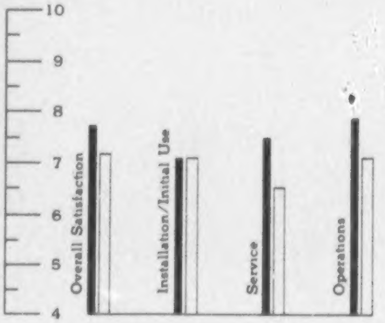
IBM JES 2 • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

25 responses • 44% judge features/capabilities outstanding • 8% considering replacement, 0% due to unsatisfactory performance.



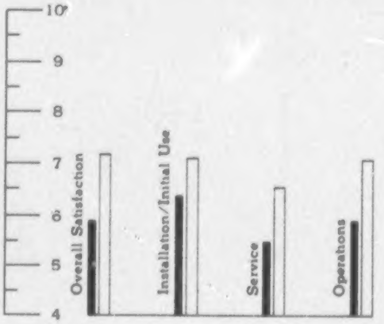
IBM JES 3 ● IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 ● 914-696-1900

23 responses ● 74% judge features/capabilities outstanding ● 0% considering replacement.



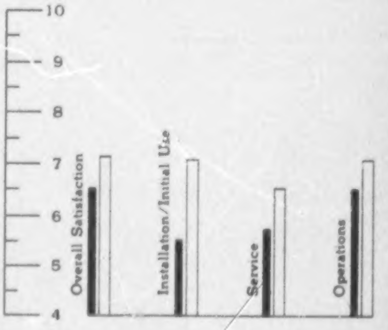
IBM MTCS ● IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 ● 914-696-1900

18 responses ● 6% judge features/capabilities outstanding ● 56% considering replacement, 11% due to unsatisfactory performance.



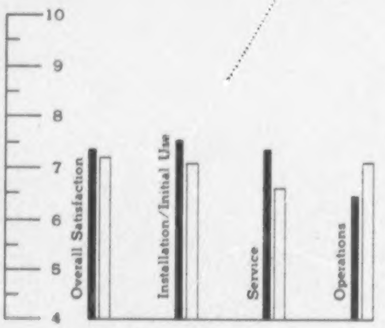
IBM NCP ● IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 ● 914-696-1900

15 responses ● 27% judge features/capabilities outstanding ● 0% considering replacement.



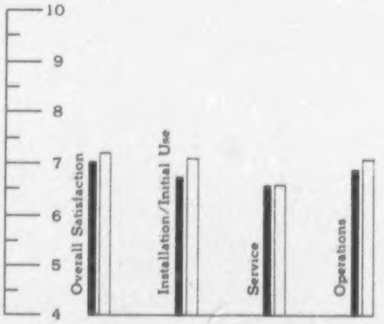
IBM TSO ● IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 ● 914-696-1900

16 responses ● 50% judge features/capabilities outstanding ● 13% considering replacement, 0% due to unsatisfactory performance.



IBM VTAM ● IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 ● 914-696-1900

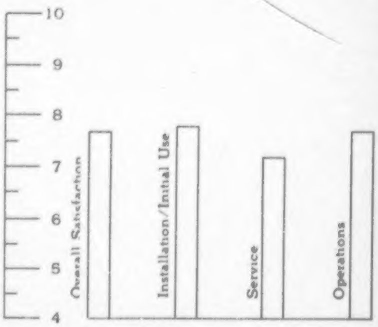
20 responses ● 45% judge features/capabilities outstanding ● 0% considering replacement.



☐ OPERATING SYSTEMS/SYSTEM SUPPORT

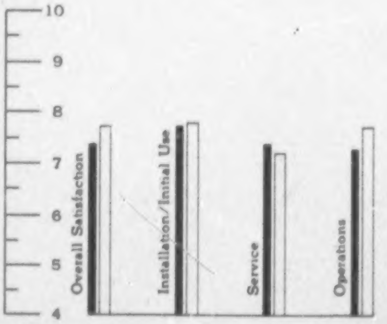
Group Average ● 26 packages

683 responses ● 50% judge features/capabilities outstanding ● 8% considering replacement, less than 1% due to unsatisfactory performance.



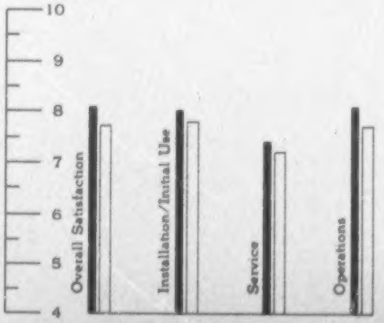
ADR LIBRARIAN ● Applied Data Research, Route 206 & Orchard Road, Princeton, NJ 08540 ● 201-874-9000

27 responses ● 59% judge features/capabilities outstanding ● 7% considering replacement, 4% due to unsatisfactory performance.



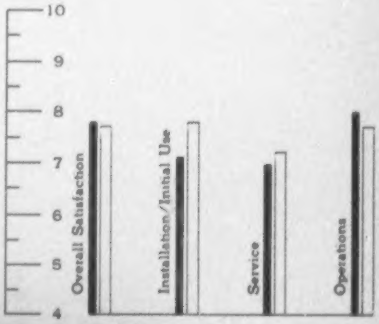
ALTERGO SPACE/MANAGE ● Insac Software Inc., 2300 Peachford Road, Suite 3235, Atlanta, GA 30338 ● 404-452-7676

16 responses ● 75% judge features/capabilities outstanding ● 0% considering replacement.



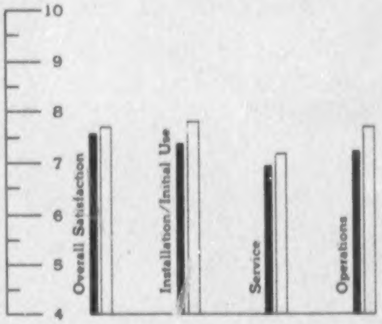
CAM-SYSTEMS ASM2 ● Cambridge Systems Group, 24275 Elise Court, Los Altos Hills, CA 94022 ● 415-941-4558

23 responses ● 70% judge features/capabilities outstanding ● 4% considering replacement, 0% due to unsatisfactory performance.



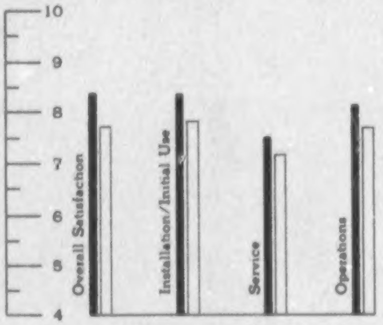
CAPEX/GULF TLMS • Capex Corp., 4125 North 14th Street, Phoenix, AZ 85014 • 602-264-7241

19 responses • 53% judge features/capabilities outstanding • 0% considering replacement.



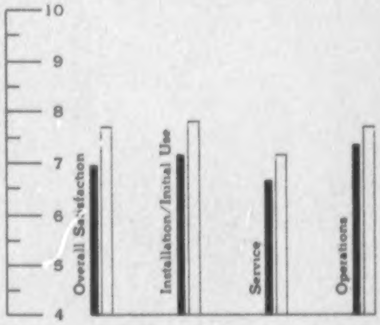
COM-ASSOC CA-SORT • Computer Associates, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6700

24 responses • 58% judge features/capabilities outstanding • 8% considering replacement, 0% due to unsatisfactory performance.



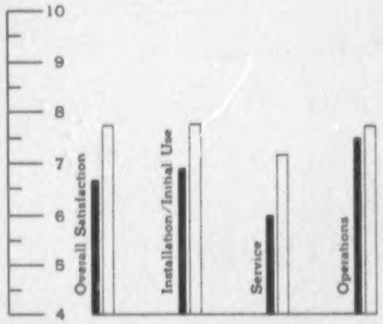
COM-ASSOC CA-DYNAM/D • Computer Associates, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6700

30 responses • 40% judge features/capabilities outstanding • 3% considering replacement, 0% due to unsatisfactory performance.



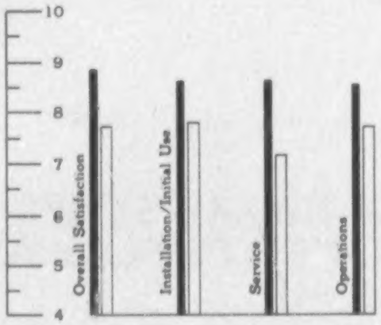
COM-ASSOC CA-DYNAM/T • Computer Associates, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6700

25 responses • 40% judge features/capabilities outstanding • 4% considering replacement, 0% due to unsatisfactory performance.



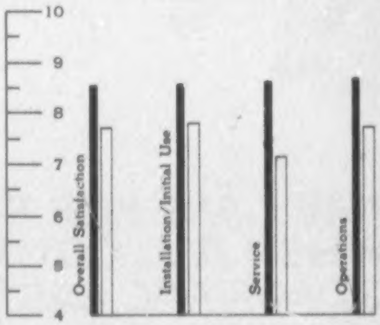
GOAL FAQS • Goal Systems International, P.O. Box 29481, Columbus, OH 43229

16 responses • 69% judge features/capabilities outstanding • 0% considering replacement.



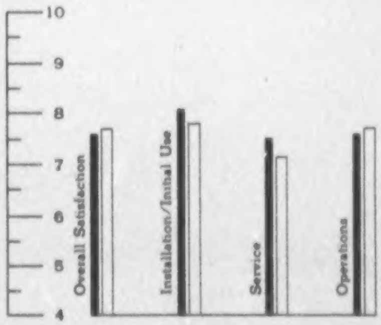
GOAL FLEE/FLIM • Goal Systems International, P.O. Box 29481, Columbus, OH 43229

33 responses • 79% judge features/capabilities outstanding • 3% considering replacement, 0% due to unsatisfactory performance.



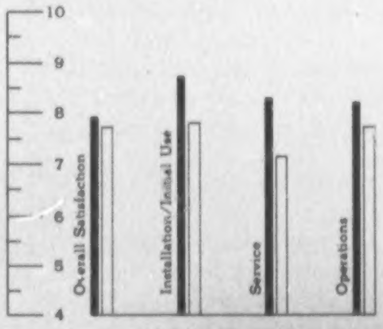
IBM POWER • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

27 responses • 44% judge features/capabilities outstanding • 0% considering replacement.



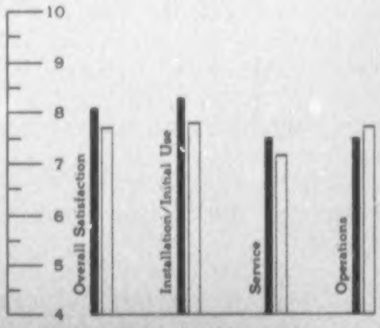
IBM UTILITY • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

44 responses • 50% judge features/capabilities outstanding • 2% considering replacement, 0% due to unsatisfactory performance.



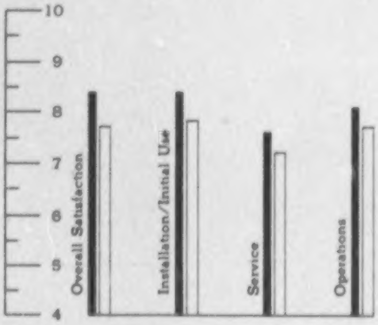
IMSL LIBRARY – SYS • IMSL, Inc., NBC Bldg., 7500 Bellaire Blvd., Houston, TX 77036 • 713-772-1927

21 responses • 62% judge features/capabilities outstanding • 5% considering replacement, 0% due to unsatisfactory performance.



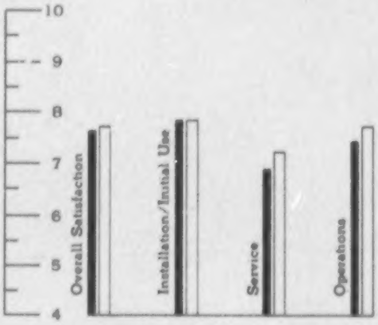
INNOVATION FDR ● Innovation Data Processing, Inc., 970 Clifton Avenue, Clifton, NJ 07013 ● 201-777-1940

29 responses ● 52% judge features/capabilities outstanding ● 3% considering replacement, 0% due to unsatisfactory performance.



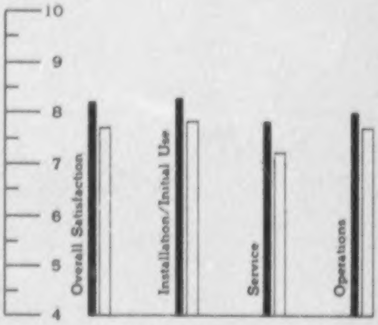
NCI SLICK ● NCI, Inc., 3720 Longview Drive, Atlanta, GA 30341 ● 404-451-7455

29 responses ● 38% judge features/capabilities outstanding ● 21% considering replacement, 0% due to unsatisfactory performance.



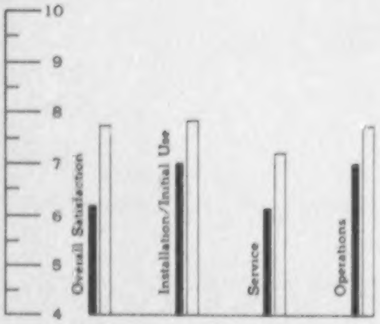
PANSOPHIC PANVALET ● Pansophic Systems, Inc., 709 Enterprise Drive, Oakbrook, IL 60521 ● 312-986-2260

31 responses ● 49% judge features/capabilities outstanding ● 7% considering replacement, 0% due to unsatisfactory performance.



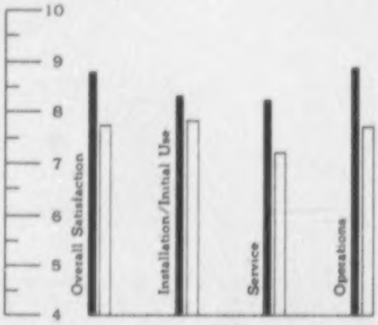
SDI EPAT ● SDI, 1700 South El Camino Real, San Mateo, CA 94402 ● 415-572-1200

26 responses ● 23% judge features/capabilities outstanding ● 23% considering replacement, 12% due to unsatisfactory performance.



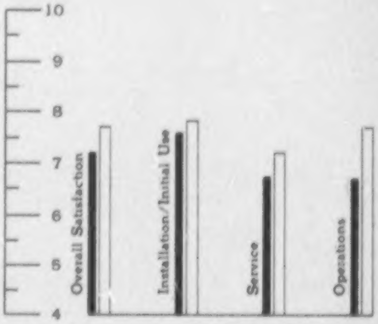
SOFT-PURSUIT DOS/MVT ● Software Pursuits, Inc. 444 Market Street, Suite 800, San Francisco, CA 94111 ● 415-392-7171

31 responses ● 84% judge features/capabilities outstanding ● 3% considering replacement, 0% due to unsatisfactory performance.



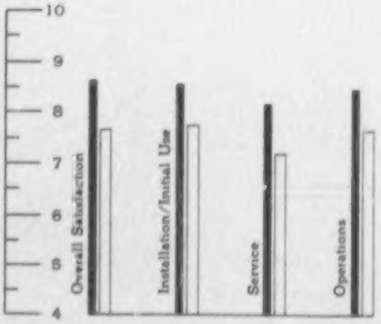
SPSS SPSS ● SPSS, Inc., 444 N. Michigan, Ste. 3000, Chicago, IL 60302 ● 312-329-2400

43 responses ● 35% judge features/capabilities outstanding ● 14% considering replacement, 0% due to unsatisfactory performance.



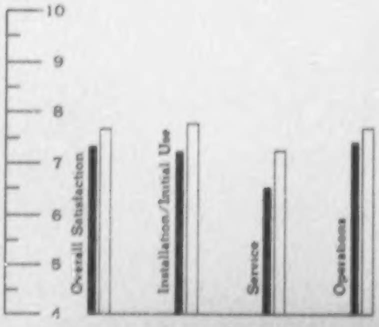
SYNCSORT/WHITLOW SYNCSORT ● Syncsort, Inc., 560 Sylvan Avenue, Englewood Cliffs, NJ 07632 ● 201-568-9700

34 responses ● 71% judge features/capabilities outstanding ● 3% considering replacement, 0% due to unsatisfactory performance.



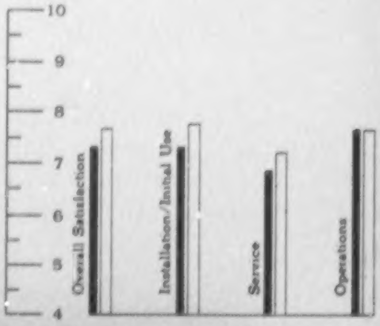
TOWER/OXFORD DFAST ● Tower Systems, Inc., 19782 MacArthur Boulevard, Suite 365, Irvine, CA 92715 ● 714-752-8263

27 responses ● 52% judge features/capabilities outstanding ● 22% considering replacement, 4% due to unsatisfactory performance.



TOWER/OXFORD TFAST ● Tower Systems, Inc., 19782 MacArthur Boulevard, Suite 365, Irvine, CA 92715 ● 714-991-9460

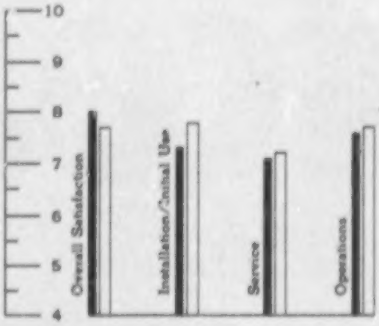
23 responses ● 32% judge features/capabilities outstanding ● 5% considering replacement, 0% due to unsatisfactory performance.



SYSTEMS SOFTWARE SURVEY

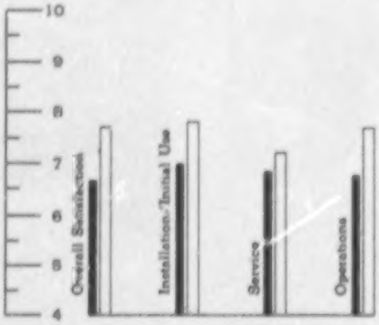
UCC UCC-ONE • University Computing Company, UCC Tower/Exchange Park, Dallas, TX 75235 • 214-353-7100

30 responses • 64% judge features/capabilities outstanding • 0% considering replacement.



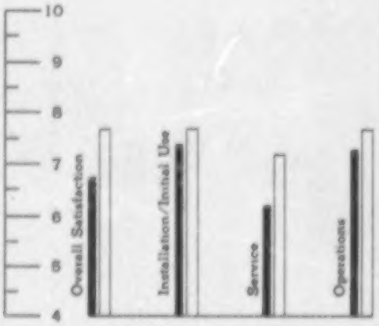
UCC UCC-THREE • University Computing Company, UCC Tower/Exchange Park, Dallas, TX 75235 • 214-353-7100

27 responses • 19% judge features/capabilities outstanding • 11% considering replacement, 0% due to unsatisfactory performance.



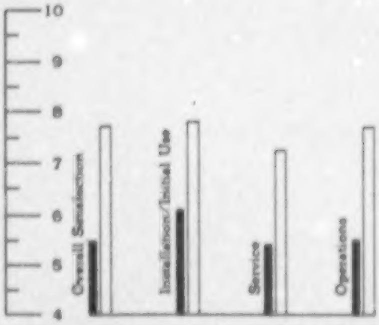
UNIVERSAL ADAS • Universal Software, Inc., Brookfield Office Park, Brookfield, CT 06804 • 203-792-5100

16 responses • 31% judge features/capabilities outstanding • 38% considering replacement, 6% due to unsatisfactory performance.



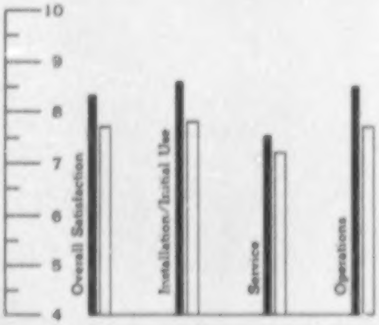
VALUE VALU-LIB • Value Computing, Inc., 498 Kings Highway, Cherry Hill, NJ 08034 • 609-482-2500

15 responses • 0% judge features/capabilities outstanding • 7% considering replacement, 0% due to unsatisfactory performance.



WESTINGHOUSE DOS DUMP/RESTOR • Westinghouse Electric, 2040 Ardmore Blvd., Pittsburgh, PA 15221 • 412-636-3100

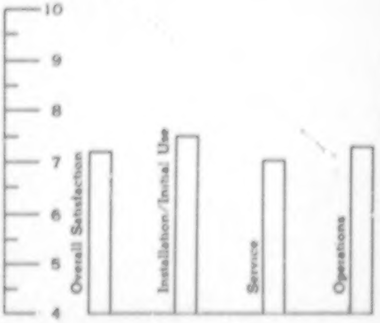
15 responses • 60% judge features/capabilities outstanding • 7% considering replacement, 0% due to unsatisfactory performance.



☐ SYSTEM MANAGEMENT AIDS

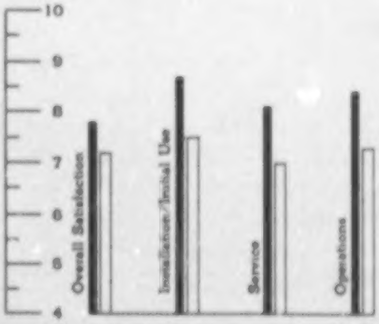
Group Average • 14 packages

278 responses • 34% judge features/capabilities outstanding • 10% considering replacement, 1% due to unsatisfactory performance.



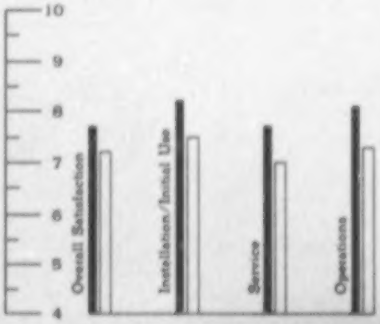
ADR LOOK • Applied Data Research, Route 206 & Orchard Road, Princeton, NJ 08540 • 201-874-9000

20 responses • 45% judge features/capabilities outstanding • 10% considering replacement, 0% due to unsatisfactory performance.



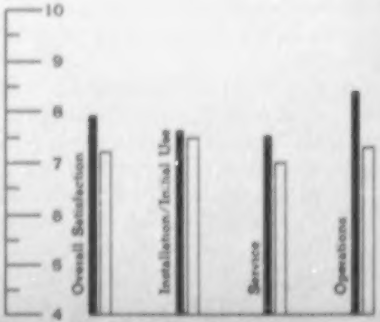
BOOLE & BABBAGE RESOLVE • Boole & Babbage, Inc., 510 Oakmead Parkway, Sunnyvale, CA 94086 • 408-735-9550

15 responses • 40% judge features/capabilities outstanding • 0% considering replacement.



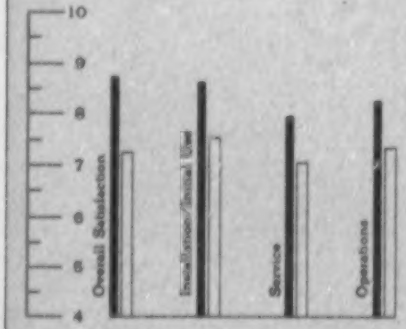
CAM-SYSTEMS ACF-2 • Cambridge Systems Group, 24275 Elise Court, Los Altos Hills, CA 94022 • 415-941-4558

16 responses • 62% judge features/capabilities outstanding • 0% considering replacement.



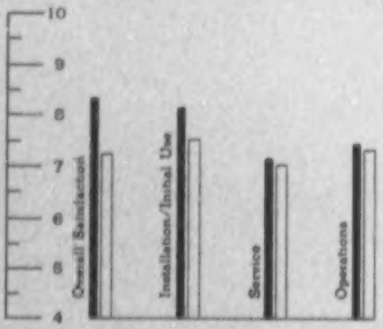
CANDLE OMEGAMON • Candle Corp., 4676 Admiralty Way, Marina del Rey, CA 90291 • 213-821-2902

27 responses • 86% judge features/capabilities outstanding • 0% considering replacement.



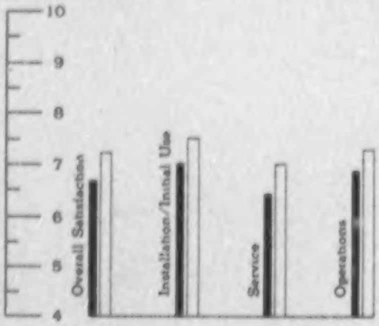
CAPEX PLAN IV • Capex Corp., 4125 North 14th Street, Phoenix, AZ 85014 • 602-264-7241

16 responses • 38% judge features/capabilities outstanding • 0% considering replacement.



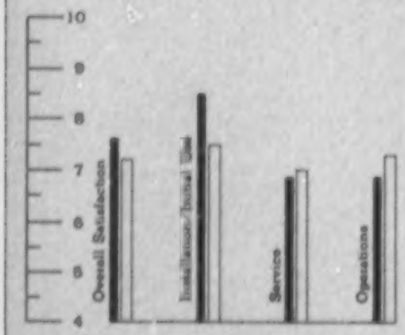
COM-ASSOC JASPER • Computer Associates, Inc., 125 Jericho Turnpike, Jericho, NY 11753 • 516-333-6700

28 responses • 32% judge features/capabilities outstanding • 14% considering replacement, 7% due to unsatisfactory performance.



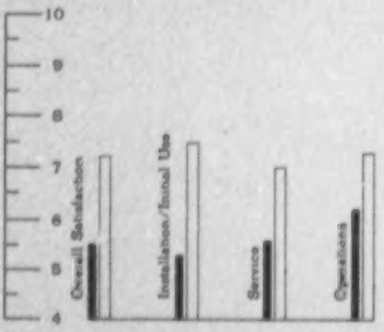
IBM DITTO • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

21 responses • 33% judge features/capabilities outstanding • 0% considering replacement.



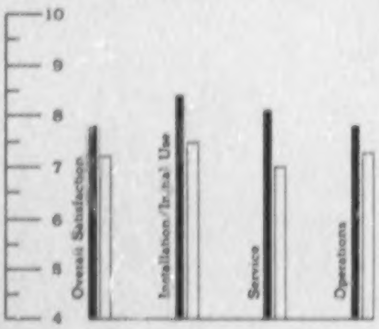
IBM DMS • IBM Corp./Information Systems Group, National Accounts Division, 1133 Westchester Ave., White Plains, NY 10604 • 914-696-1900

27 responses • 4% judge features/capabilities outstanding • 15% considering replacement, 7% due to unsatisfactory performance.



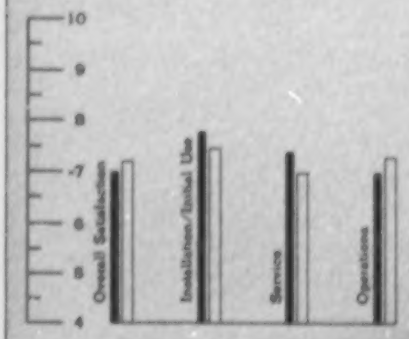
UNITED COMPUTING FORESIGHT • UnitedComputing Systems, Inc., 2525 Washington St., Kansas City, MO 64108 • 816-221-9700

15 responses • 33% judge features/capabilities outstanding • 27% considering replacement, 0% due to unsatisfactory performance.



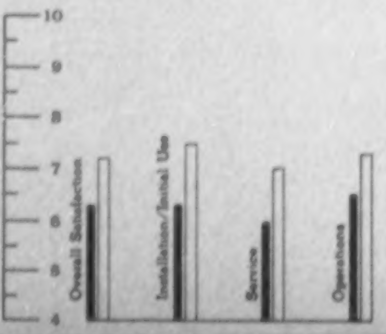
JOHNSON JARS • Johnson Systems Inc., 7923 Jones Branch Drive, McLean, VA 22102 • 703-821-1700

25 responses • 32% judge features/capabilities outstanding • 4% considering replacement, 0% due to unsatisfactory performance.



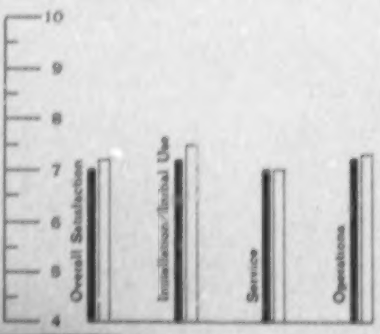
PACE KOMAND • Pace Applied Technology, Inc., 7900 Sudley Rd., Manassas, VA 22110 • 703-369-3200

16 responses • 13% judge features/capabilities outstanding • 19% considering replacement, 6% due to unsatisfactory performance.



UCC UCC-15 • University Computing Company, UCC Tower/Exchange Park, Dallas, TX 75235 • 214-353-7100

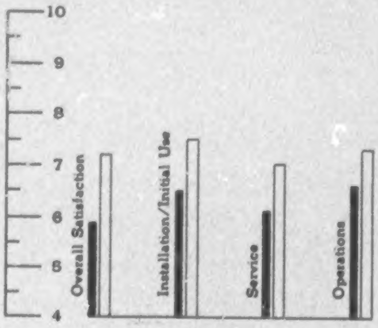
17 responses • 29% judge features/capabilities outstanding • 12% considering replacement, 0% due to unsatisfactory performance.



BEST AVAILABLE COPY

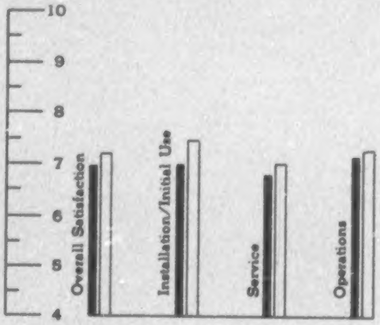
VALUE COMPUT-A-CHARGE • Value Computing, Inc., 498 Kings Highway, Cherry Hill, NJ 08034 • 609-482-2500

15 responses • 20% judge features/capabilities outstanding • 33% considering replacement, 7% due to unsatisfactory performance.



WESTINGHOUSE JOB-MONITOR • Westinghouse Electric Corporation, 2040 Ardmore Boulevard, Pittsburgh, PA 15221 • 412-636-3100

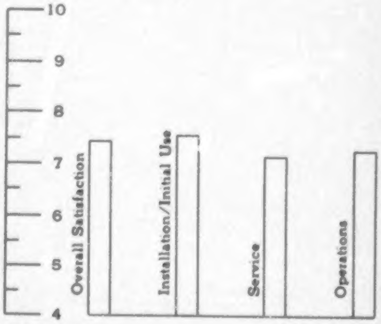
20 responses • 30% judge features/capabilities outstanding • 5% considering replacement, 0% due to unsatisfactory performance.



□ PROGRAMMING UTILITIES

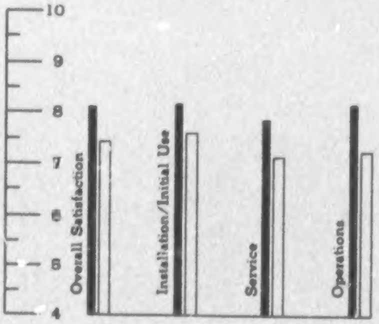
Group Average • 4 packages

99 responses • 39% judge features/capabilities outstanding • 10% considering replacement, 1% due to unsatisfactory performance.



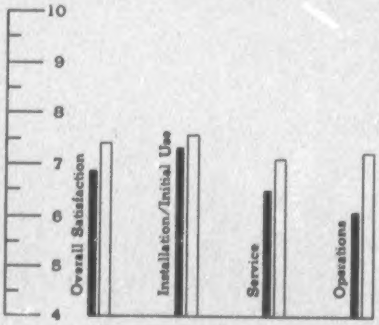
CAPEX OPTIMIZER/OPTIMIZER II • Capex Corp., 4125 North 14th Street, Phoenix, AZ 85014 • 602-264-7241

16 responses • 25% judge features/capabilities outstanding • 0% considering replacement.



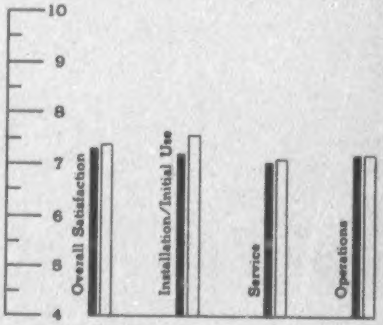
INFORMATICS MARK IV • Informatics, Inc., Software Products Division, 21050 Vanowen Street, Canoga Park, CA 91304 • 213-887-9121

20 responses • 40% judge features/capabilities outstanding • 20% considering replacement, 0% due to unsatisfactory performance.



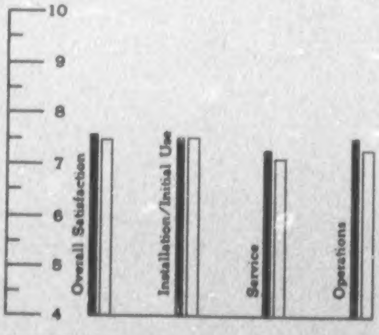
NCI OWL • NCI, Inc., 3720 Longview Drive, Atlanta, GA 30341 • 404-451-7455

37 responses • 57% judge features/capabilities outstanding • 8% considering replacement, 0% due to unsatisfactory performance.



UCC UCC-TWO • University Computing Company, UCC Tower/Exchange Park, Dallas, TX 75235 • 214-353-7100

28 responses • 34% judge features/capabilities outstanding • 11% considering replacement, 4% due to unsatisfactory performance.



DATAMATION looks to the land of the rising sun to see how the competition stacks up.

JAPAN'S TOP 10

JAPAN'S TOP 10

(ALL FIGURES IN $ MILLIONS)

1981 RANKING	1980 RANKING	DP REVENUES		DP REVENUES TO TOTAL %		FOREIGN REVENUES TO DP TOTAL %		TOTAL REVENUES		NET INCOME		YEAR ENDING
		1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	
1 Fujitsu	1	2,063	1,730	68	65	12	10	3,050	2,644	104	84	Mar. '82
2 IBM	2	1,950	1,538	100	100	25	20	1,950	1,538	178	165	Dec. '81
3 NEC	3	1,489	1,160	31	29	11	6	4,791	4,058	97	82	Mar. '82
4 Hitachi	4	1,309	1,138	13	13	10	7	9,730	8,850	304	281	Mar. '82
5 Toshiba	7	432	347	5	5	8	6	7,942	7,035	215	201	Mar. '82
6 Oki	5	425	358	44	42	14	8	974	846	15	18	Mar. '82
7 Nippon Univac	6	413	357	100	100	2	2	413	357	7	6	Mar. '82
8 Mitsubishi	8	332	282	6	5	10	8	5,980	5,552	101	105	Mar. '82
9 Burroughs	9	260	230	100	100	2	2	260	230	10	10	Nov. '81
10 NCR	10	225	219	71	67	4	5	317	328	15	21	Nov. '81
TOTAL		8,898	7,359					35,407	31,438	1,046	973	

Note: Figures in table are based on an exchange rate of $1 = 220 yen.

For the third consecutive year, IBM held on to second place honors behind front-runner Fujitsu in the 1981 tally of the top 10 companies in the Japanese data processing arena. But the real pacesetter was Toshiba, which leapfrogged over Oki Electric and Nippon Univac to move into the fifth spot in the latest rankings. To no one's surprise, however, there continue to be rumblings about IBM Japan's ability to recapture the throne currently held by local favorite Fujitsu.

It appears in fact that all those trips to Armonk by IBM Japan president Takeo Shiina have begun to pay off. In the past the Japanese subsidiary had been restricted, both in the things it was allowed to do and the way it could do them, by policies dictated years ago by IBM's world headquarters. But just as the corporation has undergone changes at home in recent months, changes that have made it more aggressive in its marketing and more receptive to working with outside hardware and software suppliers, its Japanese counterpart has also been in the throes of revamping. As a result, IBM Japan is freer to act more like a Japanese competitor, instead of like a dyed-in-the-wool American company.

Although managed entirely by Japanese nationals, IBM Japan has continued to describe its business as "information processing," rather than use any of several more common Japanese terms. Someone, for example, who might hold the title of *bucho* at a Japanese firm was called a manager at IBM Japan. These vestiges of American influence offended the sensibilities of many Japanese observers. Changes in such practices, though subtle, were deemed necessary if the firm wanted to adopt the proper Japanese style of management. These changes and more have indeed taken place, marking a new freedom that seems to be a precursor of IBM Japan's newfound ability to compete more aggressively with its domestic rivals.

The company recently completed the expansion of its Yasu plant near Kyoto, where it makes the 4331 and 308X mainframes and stuffs boards with chips made in France. It also announced plans to make its own chips, with initial 64K RAM production slated to begin in FY1983. Thus the Japanese subsidiary will be the first IBM company to have a factory that produces everything from IC chips to completed mainframes.

In August 1981 the company established a so-called Project Office headed by Shiina. Its purpose is said to be to further the "Japanization" of the company. While this reportedly includes steps the company must take to answer the needs of local customers and IBM Japan employees, the office's real goal is to devise ways IBM Japan can compete effectively with Fujitsu. In short, the company must figure out what is needed in terms of R&D, marketing, and sales strategies to return IBM Japan to its former first-place position in the country.

One of these steps was taken in October 1981 when IBM Japan, unannounced, approached domestic third-party leasing companies to see what it would take for them to handle IBM mainframes. These firms, backed by the nation's leading banks and trading companies, had previously been ignored by the mighty mainframe vendor. As these leasing companies begin purchasing IBM mainframes, the vendor's revenues should begin climbing rapidly.

OUTRIGHT PURCHASES INCREASE

It is thought that outright purchases, currently accounting for 40% of the firm's total revenues in Japan, could rise to 80% over the next several years. And if, in this way, the company achieves a 30% boost in total revenues in its current fiscal year, combined with a "mere" 20% increase by Fujitsu, that would put IBM Japan back at the top of the charts. Considering IBM's 26.7% jump last year and Fujitsu's 18.8% hike, that's not an unreasonable accomplishment. Some industry watchers, however, think it's more likely to take two or three years before IBM Japan again secures the number one niche.

In determining the top 10 rankings, dp revenues were defined as including the following product categories:

- Mainframes
- Minicomputers and microcomputers, small business systems, and personal computers
- Terminals and peripherals
- Software and services, including service bureau operations and database services
- Data communications equipment

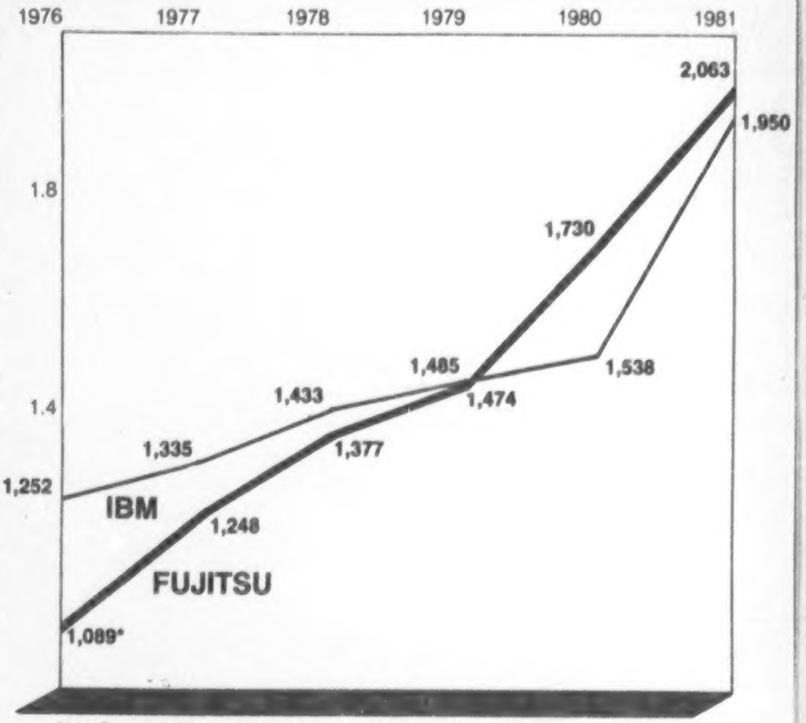
In Japan the government and most corporations follow a fiscal year that runs from April 1 through March 31, the latest fiscal year being 1981. As can be seen in the main Table, Japanese companies uniformly follow this practice, while IBM, Burroughs, and NCR have different reporting periods. (IBM's accounting follows the calendar year, and Burroughs and NCR wrap things up in November.) The table also shows that the top 10 firms had combined dp revenues last year of almost $9 billion. It is estimated that these leaders also account for about 80% of the total dp revenues in Japan.

While relative positions tend not to change much from year to year, it is interesting to see how much emphasis the vendors place on export activities. In the latest full year, NEC increased its income 124% from sales abroad, this component now accounting for 11% of dp revenues, compared to only 6% the year before (see Table II). Oki Electric doubled its revenues from exports, while Hitachi showed an 85% jump, Toshiba a 74% increase, and Fujitsu a 57% gain.

NEC's impressive performance is credited to U.S. sales of its small business computers and the U.S. and European success of its small printers. Oki Electric is also doing very well overseas with its small printers. Sales of Hitachi mainframes and peripherals by National Advanced Systems to the

FIG. 1

COMPARISON OF FUJITSU AND IBM JAPAN REVENUE
(IN $ MILLIONS)



Note: Figures in table are based on an exchange rate of $1 = 220 yen

*Estimate

TABLE I

DOMESTIC REVENUES OF TOP FOUR
(IN $ MILLIONS)

	1981	1980	1979	1978	1977	% CHANGE 1977-1981
Fujitsu	1,805	1,562	1,317	1,223	1,148	57
IBM	1,457	1,225	1,214	1,227	1,149	27
NEC	1,316	1,096	873	718	598	120
Hitachi	1,178	1,059	943	788	720	64
Total	5,756	4,942	4,347	3,956	3,615	
%IBM share	25	25	28	31	32	

Note: Figures in table are based on an exchange rate of $1 = 220 yen

TABLE II

EXPORT GROWTH OF DOMESTIC FIRMS
(IN $ MILLIONS)

	EXPORTS 1981	% CHANGE FROM 1980	EXPORTS AS % OF DP REVENUES	
			1981	1980
Fujitsu	264	57	12	10
NEC	173	124	11	6
Hitachi	131	85	10	7
Toshiba	58	74	8	6
Oki	35	100	14	8
Nippon Univac	9	0	2	2
Mitsubishi	32	40	10	8

Note: Figures in table are based on an exchange rate of $1 = 220 yen

TABLE III

REVENUE GROWTH RATE—1980-1981

	TOTAL DP% GROWTH RATE	DOMESTIC DP% GROWTH RATE	FOREIGN DP% GROWTH RATE
NEC	28.4	20.1	148.4
IBM	26.8	18.9	57.4
Toshiba	24.5	24.5	65.2
Fujitsu	19.2	15.6	56.8
Oki	18.7	11.0	98.4
Nippon Univac	18.5	15.7	*
Mitsubishi	17.7	15.2	40.0
Hitachi	15.0	11.2	64.6
Burroughs	13.0	13.0	*
NCR	2.7	3.8	*

*Not meaningful

TABLE IV

TOP 10 REVENUE GROWTH RATE

	DP% GROWTH RATE 1981	DP% GROWTH RATE 1980
NEC	28.5	25.3
IBM	26.8	4.3
Toshiba	24.5	12.0
Fujitsu	19.2	16.5
Oki	18.7	9.7
Nippon Univac	18.5	6.8
Mitsubishi	17.7	17.0
Hitachi	15.0	15.9
Burroughs	13.0	−7.5
NCR	2.7	4.8

EXCHANGE RATE RERUN

In order to achieve comparability with last year's survey, all dollar figures have been calculated at an exchange rate of $1 = 220 yen. Although the current rate is much higher, the 220 yen figure used reflects more accurately the rate during the past fiscal year.

pcm marketplace were strong, the systems also being sold by BASF of West Germany and Olivetti of Italy. Toshiba exports printers and small computers, and Fujitsu derives foreign revenues from mainframe shipments to Amdahl Corp. and Siemens in West Germany, as well as from peripherals it supplies on an oem basis to vendors like Memorex.

During 1981 Japanese users continued to step up software spending, despite their refusal in the past to pay for what they had formerly gotten free. The software emphasis became especially evident as many new software companies were formed by the domestic mainframers. Altogether, 13 companies were formed by Fujitsu, NEC, and Hitachi. That gives Fujitsu and NEC a total of 11 fully owned software houses each, while Hitachi has 15.

These subsidiary firms, usually located near customer sites rather than the home office, come in response to user demands for software. But they are also designed to keep software costs down by reducing overhead expenses and establishing lower salary schedules. Fujitsu shelled out $62 million on software development last year. The firm has said that it would like to establish 100 of these small software companies. One could argue that the vendors should contract out more software jobs. But the Japanese feel they would lose know-how in doing that, and so they take measures to keep this knowledge in-house.

Fujitsu president Takuma Yamamoto claims the technical level of Japan's software is about on a par with that of the U.S., a statement that might raise a few eyebrows across the Pacific. True or not, the Japanese clearly have an interest in such issues as programmer productivity and software engineering. Fujitsu has about 5,000 programmers, analysts, and systems engineers, which is about 30% of its total dp employment. At Hitachi the number is more like 2,000. At NEC it's about 2,500, representing roughly 30% of dp employment. The number at Toshiba, some 2,500, comes to 60% of that firm's dp employment. Toshiba, which makes no mainframes but only small business computers, sells its products through a network of dealers and thus has fewer employees. Is software a big business? Fujitsu's revenues from software products and related services came to almost $91 million, up 30% over the year before.

The Japanese last year also discovered and began pushing computer aided design (CAD). In March 1981 NEC announced a system to be used mainly for the design of printed circuit boards. Mitsubishi has a system for mechanical drawing and was preparing to introduce another one for civil engineering and electrical design. Fujitsu developed what it calls ICAD (integrated computer aided design and manufacturing system) and also began offering Lockheed's well-known CADAM which IBM Japan also markets.

Fujitsu users have taken to the processing of kanji characters, the Chinese ideograms adopted by the Japanese. Fujitsu's so-called JEF (Japanese extended feature) processes both kanji and kana characters. At the end of March 1982 there were some 900 JEF installations, accounting for a third of all Fujitsu M-Series users. This also means that Fujitsu users represent 75% of the estimated 1,200 users who are engaged in kanji processing on mainframes. By the end of the current fiscal year, Fujitsu expects that 40% of its customers will be JEF users. Meanwhile, Burroughs also launched its kanji processing system last year. Over 100 users had ordered the software, which runs on mainframes and small business computers.

The significance of the market for Japanese language processing was illustrated by the disclosure in May that IBM Japan was planning to develop its own personal computer for sale in Japan. This new machine, designed and developed by IBM Japan but probably manufactured by someone else, would purportedly process the Japanese language and have other features for domestic consumption.

BIG NEED FOR SMALL SYSTEMS

Small business computers have become de rigueur, not only among small businesses, but also with vendors. Every vendor worth his salt has one or more models in his product line. Among the leaders is Mitsubishi Electric, which has about a 15% market share. All of its small business systems are sold through dealers, only one of which it owns. Thus the announcement late last year of the five-machine Office Land family was significant.

Designed to replace the current Melcom line, the Office Land gear is sold by Nippon Univac Kaisha (NUK) as the Series 8. Univac, which has large accounts using the 1100 series mainframes, peddles small business computers to those same accounts for use as distributed processors. Business is going so well that Univac probably ranks among the top Mitsubishi dealers in sales of small business systems. Last year NUK reported sales of $59 million in small business computers, which include not only the Mitsubishi machines but also personal computers, and word processors that it acquires under an oem agreement. Nevertheless the majority of those revenues comes from Office Land sales.

Nippon Univac continues to import mainframes, specifically the 1100 series, from Sperry in the States. In fact, it installed 132 of these systems last year. But last fall it announced that it would begin offering a remodeled version of Mitsubishi's Cosmo 700 mainframe (rated at 0.5 MIPS), calling it the Univac 80 series, model 65. This marked the first time that NUK would be getting its main-

IBM has been ineffective in marketing to Japanese government offices and agencies.

frames from an outside source. Its personal computer is oemed from Sanyo Electric.

Mitsubishi Electric appears to have a tiger in its tank. The company, which along with Hitachi was indicted in California for allegedly buying and transporting to Japan trade secrets belonging to IBM, last year introduced a passel of new computers for both business and scientific applications, some featuring the higher-speed emitter-coupled logic (ECL) circuitry and available in single processor and multiprocessor configurations. The company is also expected to unveil a 32-bit small business computer.

It has also contracted to supply semiconductors to IPL in the U.S., makers of IBM-compatible computers, fueling speculation about the company becoming a supplier of IBM-compatible machines too, for next year Mitsubishi is expected to begin shipping IBM look-alike mainframes now being developed under a four-year, $91 million program. The company, whose oem sales currently account for 4% to 5% of total revenues, is hoping to boost that share to 30% by 1985.

Also on the mainframe front, Hitachi announced its most powerful model, the single processor M-280H, which is rated at 13 MIPS. A maximum four-processor complex produces 45 MIPS. The first shipment went to Tokyo University. The company also introduced the M-240H at 2 MIPS and a 4.5 MIPS M-260H. Fujitsu took the wraps off two mainframes at the high end of its M-Series family—the 15 MIPS M-380 and the 25 MIPS M-382. First installation last April was at a government aerospace technology lab, where the machines were set to perform such chores as flight simulation. The second shipment was scheduled for this past August to Kyoto University, which is getting the multiprocessor M-382 model.

Not to be outdone, NEC filled out its product line, announcing the 6 MIPS Acos 850. It falls below the previously announced Acos 1000, which has a speed of some 12 MIPS. There have been six 1000s shipped already, three to Tohoku University, two to Osaka University, and one to Ajinomoto, a maker of food products.

NEC is the nation's leading vendor of personal computers. In addition to its highly popular PC 8000, the company in September 1981 brought out new 8-bit models above and below the leader. Production of personal computers by NEC rose last April from 6,000 a month to 15,000. In its latest fiscal year, the company's sales of the tiny machines came to more than $136 million, or almost 10% of its dp revenues.

In May 1981 Fujitsu launched its first personal computer, the Micro 8, an 8-bit machine. At the end of the last fiscal year, sales hit $34 million.

Toshiba, along with Hitachi and Mitsubishi Electric, is a leader in the process control market. The three vendors account for 90% of the market, stemming from the fact that they also make the industrial machines controlled by those minis. Last year Toshiba introduced a 32-bit mini rated at 1.5 MIPS for control applications, as well as a 2 MIPS 16-bit model for the same market. Toshiba is also a market leader in word processing systems. It shipped 2,500 of them in FY81 and has a goal of more than doubling that to 6,000 in the current period.

OKI'S TERMINAL STRENGTH

Like Toshiba, Oki Electric has dropped out of the mainframe business. Oki's strength lies in terminal equipment, such as banking terminals, but it also makes small business computers, minis, and personal computers. The company made significant strides last year in its export business, which accounts for 14% of revenues, up from 8% the year before. Printers, both serial and line, are big sellers in that market. IBM Japan buys its kanji printers from Oki, which also sells to Britain's ICL.

Burroughs last year added nary a mainframe to its product line, this after the company introduced five in the previous year. It was the last foreign vendor in the top 10 to name a Japanese national as its president—a move that came last July. The company has a hardware maintenance facility in Gotemba, near Mount Fuji, but lacks a dp manufacturing plant.

In January of this year, interest was aroused when a Burroughs executive from the U.S. went to Japan to meet with Hitachi president Katsushige Mita to discuss the possibility of some sort of joint venture. But the word from inside Hitachi is that the Japanese firm is only interested in supplying mainframes to Burroughs on an oem basis. Discussions between the two companies, however, were said to be continuing. Then, in early April, three top Hitachi computer executives visited Burroughs in Detroit. Included in that contingent were the heads of a mainframe manufacturing plant and a peripheral equipment facility—all of which seems to indicate that they were examining Burroughs's manufacturing capabilities and facilities.

Ranking at the bottom, Burroughs has a long way to go to catch up with first-place Fujitsu. One might well ask what keeps Fujitsu ahead of the pack. And perhaps the answer lies not in the strengths Fujitsu has shown but rather in the weaknesses IBM Japan must overcome. Big Blue's customer base in Japan, for example, is shrinking. And that includes the number of customers, as well as the number of IBM mainframes at those user sites. A large user that previously had, say, four IBM mainframes now more likely has become a multiple-vendor site, running three IBM processors and a Fujitsu machine—or even two IBM cpus, along with a Fujitsu and a Hitachi.

The company also has been ineffective in marketing to government offices and agencies, to a large extent because of the Buy Japan policy. But IBM Japan reportedly hired some influential former government officials in preparation for a putsch. The result: zilch.

Where IBM is gaining is in export revenues. Of course, this discloses nothing about the firm's marketing skills, for in this role it is merely a manufacturing company responding to sales orders from other IBM subsidiaries. (IBM Japan is responsible for serving World Trade's A/FE division, the Americas and Far East, which includes Canada, Central America, South America, Australia, and Asia.) As shown in the top 10 chart, IBM is far and away the leader in revenues from foreign sales. And this is growing fast, perhaps fast enough to make up for diminished sales in the domestic domain. Maybe next year, after a four-year hiatus, IBM Japan will again be king of the mountain. ●

"Yeah? Well according to *my* voice-stress analyzer, *you're* lying!"

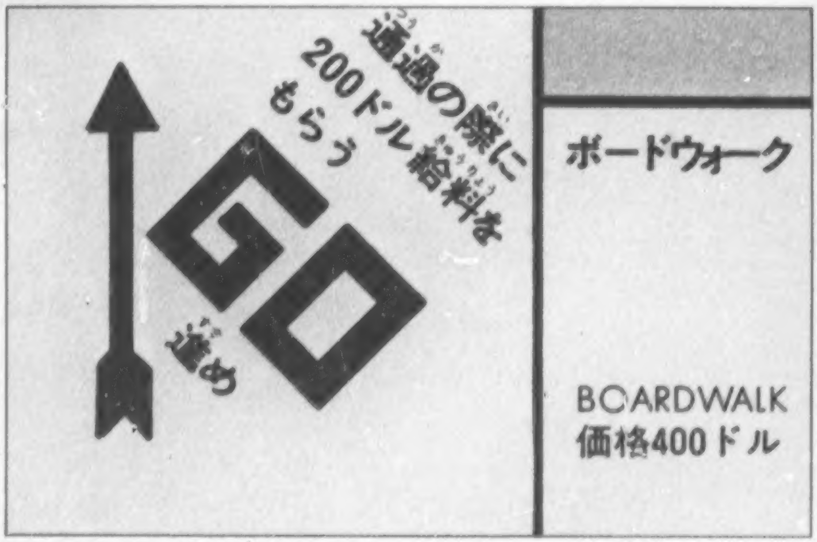
© DATAMATION

CARTOON BY SIDNEY HARRIS

Does the powerful island nation have what it takes to compete in the worldwide systems market?

EVALUATING THE JAPANESE CHALLENGE

by Ulric Weil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Are the Japanese for real in the high-growth worldwide computer and telecommunications market? Are their overseas successes in selected product areas the beginning of a tidal wave of Japanese systems destined to subjugate the U.S.-based computer industry? Or is the steadily building flow of Japanese-made electronic black boxes merely another demonstration of that country's unmatched excellence in mass production of high-quality, low-cost hardware?

At present, Japan's computer export goals are largely limited to supplying certain hardware items to American and European resellers—an original equipment manufacturer (oem) marketing strategy. The Japanese are expected to expand their efforts to encompass most of the big-volume hardware products. Their superior manufacturing technology could give them a distinct cost advantage in this product category. In 1986 the Japanese should be able to export at least 20% of their estimated total production, which will then be worth about $12 billion on an if-sold basis.

A number of U.S. and European information processing companies may get hurt unless they form alliances with the Japanese. While some firms are likely to link up with Japan, others will go it alone. Leading hardware producers such as IBM, Digital Equipment, Hewlett-Packard, and Wang Laboratories, for example, can undoubtedly cope satisfactorily.

In the case of Japan, the past is merely a prolog. Later in this decade the fully integrated Japanese computer/telecommunications companies, along with several of their specialty houses (Sharp, SORD, Casio, etc.), plan to become systems vendors. To reach this goal, they must first solve their present software development problems—problems that probably will be resolved in the next five to seven years. Once this software gap is closed, the Japanese can compete in the overseas systems arena through direct end-user marketing deals or ties with Stateside or European partners.

Thus, the Japanese may increase their currently scant market share in the systems business (which includes software packages developed locally or copied from the West) to about 6% as early as 1987. That is when the real battle will be joined, because as soon as the Japanese can compete effectively in programming, worldwide software prices will begin to drop.

Fueling this trend will be software portability—a concept that will have taken firm hold by the end of the '80s. As a result, software may acquire quasi-commodity pricing characteristics not unlike those of today's hardware. This has important implications, since the American computer manufacturers currently derive their highest revenue growth and increasing profits from the sale of software. By 1990, the Japanese are likely to cut into these sales, causing the U.S. computer industry's revenue growth rate, currently set at 15% to 20% per year, to slow. Honing software skills (including finding a way to overcome the programming productivity bottleneck), however, will not be easy for the Japanese, who have a tough time with the conceptual nature of software development and the English prerequisite of standard programming languages such as COBOL, FORTRAN, PL/1, and BASIC.

In the meantime, Japanese vendors will continue to capitalize on their superior know-how in factory automation (including the use of intelligent robots in flexible manufacturing systems). Thus, their competitive edge on the hardware side will sharpen. As a result, the second-tier companies on both sides of the Pacific will be under the gun, while the third-tier firms may end up going to the wall. Clearly, the margin for error in the emerging tough environment of super efficient mass production and streamlined distribution is shrinking rapidly.

BUNCHING WITH THE JAPANESE

The BUNCH companies—Burroughs, Univac, NCR, Control Data, and Honeywell Information Systems—may want to align themselves with the Japanese, taking advantage of a natural division of labor. Under such a setup, the U.S. companies could concentrate on worldwide distribution, while their Japanese partners manufactured on the basis of their stipulated design specifications.

TABLE I

JAPANESE COMPANIES RANKED BY 1980 R&D EXPENDITURES*

COMPANY	R&D EXPENDITURES (IN $ MILLIONS)	% OF NET SALES
Hitachi	466	5.8
Toshiba	325	4.8
Matsushita Electric	236	2.9
NEC	203	6.0
Mitsubishi	203	4.0
Sony	155	7.0
Fujitsu	144	6.1

*Figures include all corporate R&D, not just for computer operations.
Source: Nihon Keizai Shimbun

Of course, there is always room for well-managed, innovative, and entrepreneurially run niche firms. Today's Tandem and Cullinane and tomorrow's Apple are in this category. Such dream companies exist on both sides of the Pacific. The U.S., however, remains a more hospitable environment for startups and venture capital.

Japan's international trading practices, which include such allegedly aggressive export marketing tactics as predatory pricing as well as import restrictions in the form of selective quotas and relatively high tariffs, have created friction and encouraged latent protectionist sentiments in the U.S. and Western Europe. This article's assessment of the Japanese computer industry's potential for threatening America's current dominance of the worldwide dp market does not take into consideration the fallout from economic warfare, should the U.S. and Western Europe, frustrated by Japan's export-import policies, decide to adopt stringent protectionist measures of their own.

Partly to forestall such moves, some of Japan's high-technology firms are currently shifting some of their manufacturing operations to the U.S. and Western Europe. In any case, the dp industry is becoming internationalized at such a rapid pace, thanks to the increasing number of Japanese partnerships in America and Europe, that any significant legislated partitioning would do much harm and little good. In other words, the economic principle of comparative advantage is working and, except under conditions of military hostilities, cannot be denied in the industrialized world as we know it.

Japan will become an increasingly important factor in the worldwide dp arena. In several product areas, such as convenience copiers, facsimile machines, and handheld computers, the Japanese already dominate the market. This is also true of semiconductor devices such as 16K RAMs, 64K RAMs, and certain ROM parts. In addition, the Japanese are beginning to take a significant share in such important, high-volume, and price-sensitive submarkets as matrix printers, PABXs, IBM plug-compatible central processors, crt-based terminals, and medium-speed copiers/duplicators.

Ominously, there is evidence that the Japanese, with their usual care and diligence, are preparing to encroach upon some still relatively untouched overseas submarkets: intelligent reprogrammable and adaptive (self-learning) robots, personal computers (using second-sourced U.S.-developed 16-bit and 32-bit microprocessors), disk drives, supercomputers (very large-scale, scientific number crunchers), all kinds of office automation gear (word processing equipment, intelligent copiers, laser printers, and graphics devices), and voice recognition units. Unless stopped by superior U.S. products that can be manufactured in volume at very attractive costs or delayed by unforeseeable design problems, the Japanese are likely to become forceful competitors in these areas within two to three years.

Besides asserting themselves in computer hardware, the Japanese computer vendors are also making substantial strides in mastering a few important application systems, such as flexible manufacturing systems (FMS), computer integrated manufacturing (CIM), computer aided design and computer aided manufacturing (CAD/CAM), computer generated graphics, and electronic banking.

According to Morgan Stanley estimates, computer production by vendors operating in Japan (including foreign companies) will achieve an average growth of approximately 18% a year on an if-sold value basis. Exports of computers and related equipment, however, are likely to grow faster than that, possibly 30% a year on average over the next five years. Key reasons for this rapid export expansion are:

- High (30% a year or better) projected growth in the market for small business systems, personal computers, and intelligent terminals
- Brisk increases in demand for telecommunications products such as PABXs and other digital switches
- Growing worldwide acceptance of Japanese products (including large-scale, often IBM-compatible mainframes and associated peripherals)

If the Japanese computer manufacturers can sustain these growth rates, they will be exporting as much as 20% or about $2.5 billion worth of their annual production of computers and related equipment by 1986. According to informed estimates, the 1986 value of worldwide computer shipments by U.S. manufacturers will exceed $60 billion. Therefore, by 1986 the Japanese would have only a 5% share in the North American, South American, and European markets, compared with a 55% stake in their home market.

Of course, there are those who argue that these assumptions regarding production and exports, which are derived from estimates supplied by the Ministry of International Trade and Industry (MITI), are too conservative and that, in fact, the Japanese's goals are more aggressive. This is possible, if not likely, but in any case it's doubtful that the Japanese can take more than a 5% market share (as defined here) by 1986. By the end of this decade the Japanese may attain roughly a 15% market share, if all goes well—if, for example, the Japanese can maintain compatibility with IBM's extended architecture.

THE TOTAL SYSTEM SOLUTIONS

The Japanese still are well behind the U.S. computer industry in offering competitive total system solutions to meet North American and European customer needs. Fujitsu and Hitachi are pursuing an IBM software-compatible strategy; the firm's overseas marketing is being handled by U.S. or European firms under varying contractual provisions. In the States TRW has linked up with Fujitsu, which owns significant equity in Amdahl, while National Advanced Systems (NAS) markets Hitachi systems, and Univac recently entered into an agreement with Mitsubishi. In Europe, Hitachi markets through NAS and Olivetti, while Fujitsu uses ICL and Siemens. These arrangements have had limited success—the most rewarding one being Fujitsu's oem relationship with Amdahl.

Astute industry observers have known for some time that pursuit of an IBM plug-compatible strategy (central processing units or major peripherals) is fraught with peril. IBM itself is trying hard to shorten the new product life cycle—its emphasis on purchasing (as opposed to leasing) facilitates this effort. Purchase price cuts are one of IBM's weapons to implement this strategy; another is long-term, full pay-out leases, which are treated as sales in accordance with normally accepted U.S. accounting standards.

At the same time, having expanded its capacity very significantly in recent years (over $6 billion was spent on plant, property, and equipment from 1979 to 1981), IBM is now able to ship substantial volumes of its new products within a matter of months fol-

Being profit oriented, the Japanese know they *must close the software gap.*

lowing their announcement. Previously, the plug-compatible manufacturers had sufficient time to decipher the design characteristics of IBM's new offerings as the company initially shipped only relatively small quantities of the new equipment. By the time IBM shipped in volume, the plug-compatible vendors were ready to respond.

Under IBM's current mode of operating—a shortened product cycle and faster volume shipments—the pcms are under severe pressure to keep up. If they wait until they can reverse-engineer from the new IBM hardware, they may only begin volume deliveries when IBM announces a new version of the currently marketed product or a new offering that replaces it, thereby nullifying much of the effort.

This pressure was dramatized recently when certain employees of Hitachi and Mitsubishi were charged by the U.S. Department of Justice with engaging in a conspiracy to steal IBM's computer designs and technology, particularly those relating to the M3081 large-scale computer and M3380 high-performance disk subsystem. If the plug-compatible manufacturers can obtain design documents prior to or concurrent with IBM's first customer shipments of a new product, their ability to respond in the marketplace on a timely basis is much enhanced.

What happened in the case of Hitachi and Mitsubishi may indicate just how successful IBM has been in making itself a moving target and how difficult it may become for the plug-compatible manufacturers to maintain true compatibility. Sooner or later the managements at some of these companies will have to ask themselves if it is indeed really worth it.

Nippon Electric (NEC), on the other hand, is trying to go the independent or non-IBM-compatible route. To this end, the company is establishing its own overseas marketing capabilities, a costly and time-consuming chore. NEC may eventually join forces with one of the U.S. or European mainframe vendors such as Honeywell Information Systems, NCR, or Sperry Univac. In effect, NEC is the Japanese version of America's BUNCH companies, although it is probably the best of the bunch. The company's real appeal stems from its strong position in semiconductors and telecommunications (today a sine qua non for success in the information processing world).

Hitachi's willingness to tolerate relatively low (7%) net margins enables it to squeeze by, while Fujitsu, with its net margins scraping the bottom of the barrel at about [illegible]%, barely survives. Both companies' longevity depends on their ability to maintain IBM software compatibility—a task that is getting tougher all the time.

Of course, in Japan itself these two vendors, along with NEC, should hold on to their hefty market shares (Fujitsu 20%, Hitachi 15%, and NEC 14%) by virtue of the implicit local buying preference in the important government and quasi-public sectors. Also, in the home market, Fujitsu's and Hitachi's commitment to maintaining compatibility with IBM's H Series, albeit with a one- to two-year lag, is quite acceptable. In any case, Fujitsu offers its own OSIVF4 operating system. At the application interface, this system is compatible with IBM's de facto 24-bit standard that, practically speaking, will be the prevailing computer architecture for several more years. While OSIVF4 is well accepted in Japan, Fujitsu has been unable to market this operating system overseas.

Fujitsu, Hitachi, NEC, and Mitsubishi under their own logos will not be big factors in the international market for broad-based integrated systems for virtually the rest of the '80s. In other words, IBM, Digital Equipment, Hewlett-Packard, and Wang Labs, the leading broad-based U.S. vendors, have little to worry about, provided they do not let their guard down—something they are not likely to do. Over the next several years and especially later in the decade, however, the Japanese computer industry is likely to hurt the BUNCH companies and force one or more of them to take on a Japanese partner.

While the Japanese will be increasingly successful in selling electrical/electromechanical hardware and components to oems in North America and Europe, they have no foothold at all in the overseas software (systems and applications) market. As everyone knows, separately priced software (along with software-driven application systems or problem solutions) is becoming the true value-added component, while much of the hardware is becoming a quasi-commodity product. The Japanese understand this only too well. Being profit oriented, albeit much more patient than their overseas peers, they know they must close the software gap in order to participate in this lucrative submarket. This will require continuing high (by Japanese standards) R&D spending. To give you an idea about Japan's R&D outlays, Table I shows recent R&D expenditures for most of the major Japanese computer/communications companies. (Also, see story "Japan's Research Realm" p. 164-19.)

By boosting R&D funds, the Japanese hope to remedy their acknowledged software deficiency, particularly in the applications area. This will not be easy. Fujitsu, Hitachi, and NEC operate numerous so-called software factories where the usual programmer productivity schemes (including application generators) are used. As has been the case in the U.S., none of these tools produce significant results. Moreover, despite these steps, the Japanese are no closer to a breakthrough such as a methodology for automatic programming. Last but not least, while the Japanese computer manufacturers have developed many excellent and sophisticated application programs for their own market, by and large they still lack the know-how and in-depth understanding to develop applications that satisfy the constantly changing needs of overseas customers.

ENGLISH LANGUAGE PROBLEMS

English language problems help explain why the Japanese have trouble in software development. Most software (system and applications) in the public domain uses symbols, mnemonics, and documentation in English, not Japanese. This makes the learning process tedious for most Japanese programmers who are no better at English than American programmers are at French.

Also, the design and development of system software, especially very advanced, complex operating systems, is an art, not a disciplined science. It requires a high level of conceptualization—something the Japanese are not nearly as proficient in as they are in developing physical factory automation systems. Not surprisingly, Hitachi's own operating systems for its M-Series of IBM-compatible mainframes are thinly disguised copies of IBM's 370, DOS, VS1, VS2, and MVS, while NEC's Acos operating system is a derivative of Honeywell's (formerly General Electric's) Gecos. Therefore, for the next five years, the Japanese will not be able to offer software outside their home market that is functionally superior or significantly lower priced than their overseas rivals.

The Japanese, however, will soon learn to copy selected foreign packages for resale at prices below those of the original. Unless legal means can stop or delay the Japanese from selling these copies in overseas markets (probably via U.S.-based partners), the present high revenue growth (about 30% a year) now enjoyed by most U.S. computer companies will start to slow down.

Then, perhaps by 1987 software will take on a quasi-commodity status—the same status that some hardware items had begun to attain in the mid-'70s. Industrywide adoption of a number of interface protocols and acceptance of certain operating systems standards will encourage the trend toward software portability, allowing many packages and operating systems to run on a variety of computers manufactured by different vendors.

By the turn of the decade, the Japanese may have mastered the software development process, marketing very low-cost packages (systems and applications) of their own design that conform to industry standards. After all, once the software design and development expenses have been amortized

By 1990 the economics will be right for Japan to invade the overseas systems market.

or expensed, the manufacturing cost is virtually nothing, and maintenance fees will also be minor, thanks to the advanced diagnostic procedures that should be on tap by 1990. By then the economics will be right for Japan to invade the overseas systems market, using price and quality as the wedge to gain entry and acceptance.

In the '90s software may indeed become a quasi-commodity just as hardware is becoming one in the '80s. Accordingly, revenue growth of the computer industry will slow, and there will be a profitability squeeze due to the impact of reduced prices. The fully integrated, broad-based companies with worldwide distribution and highly automated manufacturing facilities that permit low-cost, high-quality mass production will have the advantage. The well-run, innovative firms will also still have a place in the sun. Meanwhile, the staid BUNCH companies will come under increasing pressure from IBM, the deregulated AT&T, Digital Equipment, Wang Labs, Hewlett-Packard, the specialized personal computer vendors, and, of course, the Japanese.

There are a number of relatively small, often privately held computer companies in Japan. One of these is SORD, a successful and highly regarded maker of software-rich personal computers. The existence of firms like SORD shows that the cliché regarding the Japanese inability to be entrepreneurial or innovative is just that—a well-worn cliché. It is undoubtedly true, however, that the entrepreneurial juices are flowing much more freely in the U.S. than in either Japan or Europe.

BETTER MANAGED COMPANIES

At the same time, the large Japanese firms like Sony and Matsushita are managed more effectively and in a more disciplined and motivated manner by hands-on executives than equivalent U.S. companies. And, as everyone knows by now, the Japanese workers are more dedicated, industrious, loyal, and quality-conscious than the employees in the U.S. or Europe. These attributes and the concomitant harmonious management style based on consensus rather than adversary relationships amplify Japan's longer term threat to the U.S. and European computer industry.

That is not to say, however, that everything the Japanese computer/communications industry touches automatically turns to gold. An examination of the country's fifth generation computer project, for example, raises serious doubts about the program's feasibility, at least within the specified time frame. In magnetic storage devices (tape, disk) as opposed to input/output gear, the Japanese do not appear to be going very far, although they may grab the lead in the emerging vertical recording and laser-based video disk technologies.

Why are the Japanese so good at making quality hardware in volume at highly competitive costs? Numerous books have been written on this general subject, so there is no need to repeat the now familiar arguments. But one should recognize that while the U.S. computer and telecommunications industry is taking steps to get manufacturing quality up and costs down, the Japanese are also continuing to move ahead. In other words, the relative cost-quality gap may narrow some over the next several years as the efficient, dominant U.S. competitors tweak the underlying positive price elasticity of demand (by lowering their prices) and automate their production processes.

Japan, nevertheless, will probably stay ahead in manufacturing technology. They must; their population is aging (their birthrate declining), and the people's drive for less monotonous work and shorter hours is becoming a political issue that can only be handled by the fullest use of available technologies. Benefiting from a nonadversarial management-labor relationship, Japanese companies can assign and transfer employees to varying tasks on the basis of need, adopt the latest techniques, and develop a knowledge-intensive society using information systems sooner than their Western counterparts.

No assessment of Japan's computer export strategies would be complete without a reference to MITI. Ministry officials are readily accessible and willing to discuss issues—real and perceived.

As previously pointed out, the Japanese computer and communications industry does not operate as part of the mythical Japan Inc. Instead, each of the dozens of large-, medium-, and small-sized companies compete fiercely with each other. They aggressively discount prices to snatch an order and feel free to disregard MITI, which gives them annual government subsidies and grants that are still relatively small by U.S. standards. It is fair to say, however, that given Japan's strong commitment to building a knowledge-intensive society, the government will protect its major computer industry assets and continue to stimulate appropriate investments to achieve the national goals. ●

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A principal and vice president at the New York investment banking and brokerage firm of Morgan Stanley, Ulric Weil took a fact-finding trip to Japan last spring. His recent book, *Information Systems in the '80s—Products, Markets, and Vendors*, is published by Prentice-Hall, Englewood Cliffs, N.J.

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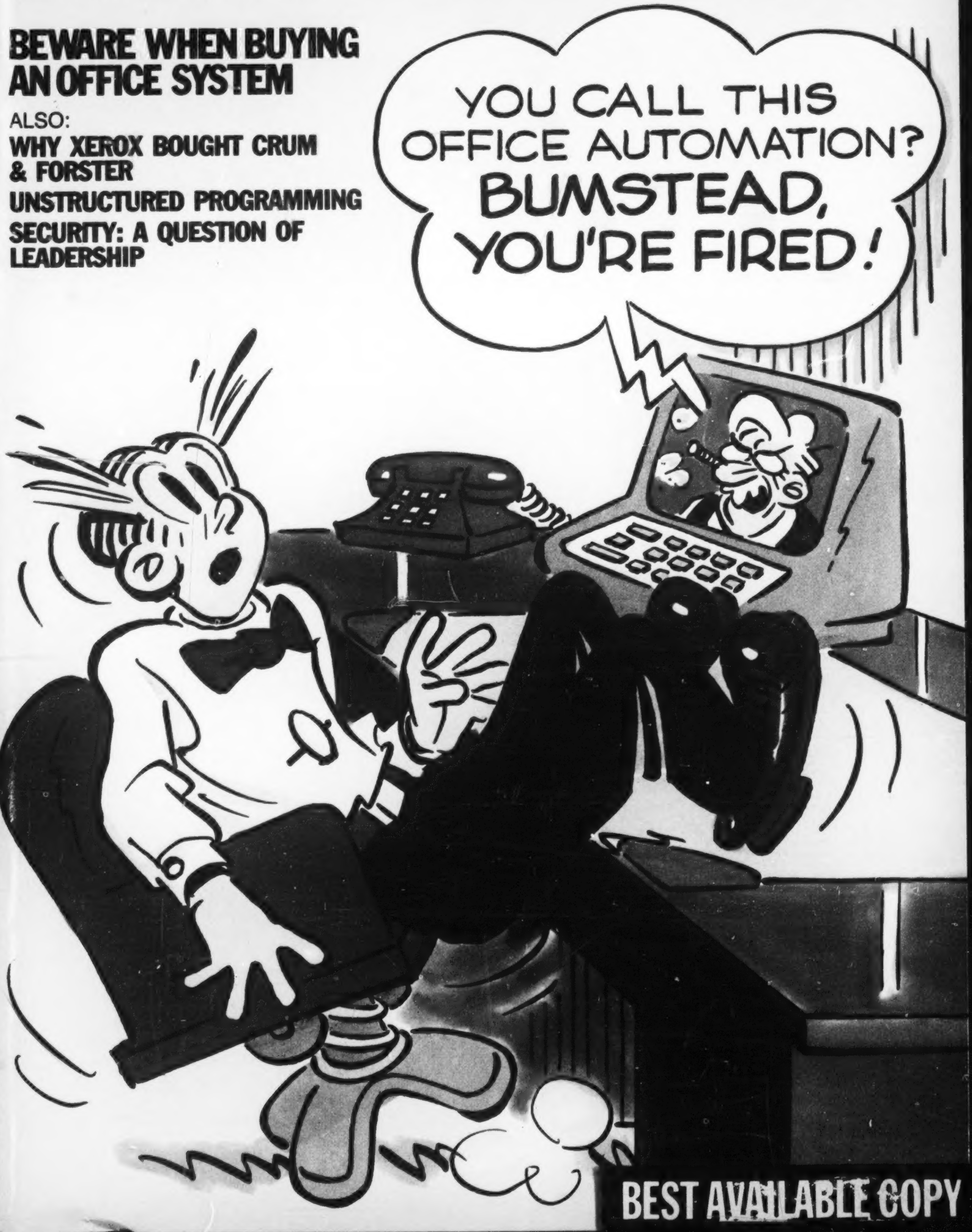
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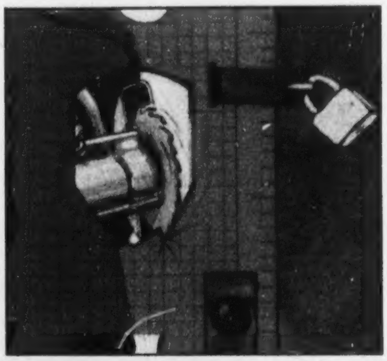

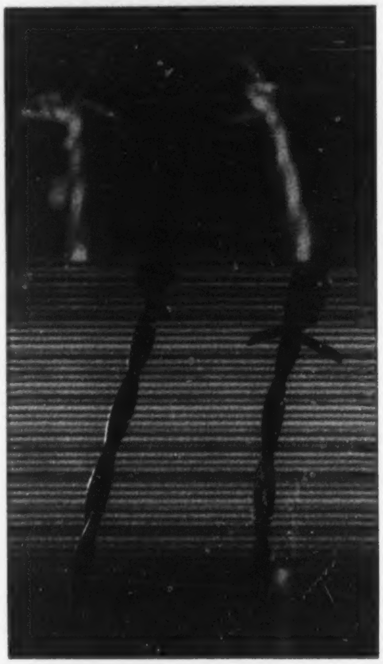

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Supermicros are setting new price/performance levels, offering a challenge and an opportunity to the oem and system integrator.

SELECTING SUPERCHIPS AND SUPERMICROS

by Omri Serlin

Superchips—high-performance microprocessors (MPUs)—are here. So are complete general purpose computer systems using such MPUs, known as supermicros. These supermicros, typically based on the Intel 8086, the Motorola 68000, and occasionally the Zilog Z8001, can match or even surpass minis like Digital Equipment's PDP-11/45 in performance and multi-user features, while offering the low cost and compact packaging typically associated with microcomputers.

More than 60 U.S. firms, and several European and Japanese ones, already offer supermicro systems. Many are little-known startups, but IBM, Hewlett-Packard, Tandy/Radio Shack, Intel, Zilog, and Motorola are also participating. Not a week goes by, it seems, without some new supermicro being unveiled by some new entrant in the field.

Although the business is currently affected by the unsettled economic conditions in the U.S. and abroad, the long-range prospects are excellent. The worldwide market for supermicros will grow far faster than the markets for mainframes or minis. In 1986, some 235,000 units will be shipped, worth more than $5.5 billion in terms of 1981 end-user dollars. Included in that figure are initial shipments and sales of aftermarket hardware, software, maintenance, and supplies. In terms of dollar volume, the 1986 supermicro market will nearly equal the $6.3 billion market for 8-bit microcomputers.

Supermicros represent both a challenge and an opportunity to the oem and system integrator. MPU-based systems will eventually eliminate minicomputers as a useful product. This hasn't happened yet, but the overall trend is already fully evident. Supermicros, in particular, are already challenging conventional minicomputers—and even superminis—in many general purpose and business applications as well as in such specialized applications as graphics workstations, portable executive terminals, CAD/CAM terminals, and fault-tolerant systems.

A significant portion of the growth in the supermicro market will come at the expense of the minicomputer vendors. It will also affect those oems who use minicomputers to implement applications that can be performed equally well with supermicros. The computer manufacturers who have signed or are negotiating for oem agreements with supermicro suppliers, such as Convergent Technologies and Fortune Systems, are doing so partly because they have no effective answer of their own to the supermicro onslaught.

On the other hand, supermicros create new market opportunities. Many small businesses could benefit from, but cannot afford, the mini-based vertical market applications systems now available. But they could well manage to budget for the same (or similar) application implemented on a supermicro system. Specialized intelligent terminals and workstations and fault-tolerant transaction processing systems represent two other areas in which superchip-based designs are opening up lucrative new opportunities.

No oem or system integrator can ignore the impact of superchips and supermicros. Those with existing systems must evaluate the challenges posed by the superchip-based newcomers. Others who may have been kept away by the low performance of 8-bit micros on the one hand and the relatively high cost of conventional minis on the other must reevaluate their positions in light of the new price/performance level established by the supermicros. They must also examine the new opportunities presented by supermicros.

THE SUPERCHIP IS SUPER

The superchip is one of the new wave of MPUs that differs from the currently popular 8-bit micros primarily in its ability to exchange data with the external world—in particular, the memory system—in chunks of at least 16 bits at a time. This is important because most instructions and most data items, even in an 8-bit micro, contain at least 16 bits.

Some 16-bit chips sets and chips, for instance the DEC/Western Digital LSI-11 chip set, Data General mN601, and Texas Instruments TMS9900, became available in the early and mid-1970s. These circuits were meant to capture in VLSI the architecture of existing minicomputers from these manufacturers. But they won only limited acceptance outside their captive markets. More independent superchips—those designed by semiconductor manufacturers—began to appear in 1978. Today, this class includes the Intel 8086 and 286, the Motorola 68000, and the Zilog Z8001. Two more recently announced products—the National NS16032 and the TI TMS99105—have gone into production. (Table I summarizes some of these five chips' characteristics.)

The Intel 8088 and the Zilog Z8002 are sometimes called 16-bit MPUs, and are indeed capable of manipulating 16-bit data items internally. But the 8088 does not meet the 16-bit external data-bus test and is therefore not a true superchip. The Z8002 falls short on the extent of its address space. A large address space is one of a true superchip's most important traits. The Motorola 68000, for instance, uses 24-bit addressing and can linearly address a 16-megabyte space, just as the IBM System/370 and 43XX mainframes do. Other superchips achieve a large address space through segmentation, a scheme by which a program can switch, in a relatively easy way, between a large number of small segments. Segmentation is typically used to maintain compatibility with earlier 8-bit micros that could only address between 32K and 64K bytes.

A large, linear address space makes life much easier for the assembly-language programmer. More importantly, it makes large programs, such as those typically produced by high-level language compilers, more practical. The ability to efficiently support high-level language programming will become more critical in the supermicro environment, just as it became key to the popularity of minicomputers 10 years ago.

Microcomputer development today closely parallels that of the earlier minicomputers in another significant respect. Like the 16/32-bit minis of a decade ago, some superchips—notably the Motorola 68000—are designed internally as 32-bit machines; that is, they have 32-bit-wide registers and data paths, and can perform some operations on

TABLE I

SUPERCHIP COMPARISON

	INTEL 8086	MOTOROLA 68000	ZILOG Z8001	NATIONAL NS16032	TI TMS99105
Announced	Early '78	Mid-'79	Late '78	Feb. '81	Oct. '81
Production	Mid-'79	Mid-'80	Early '81	July '82	Jan. '83
Clock Rate (MHz)	5,8,10	4,6,8,10,12	4,6	10	24 (4-phase)
Packaging	40-pin DIP	64-pin DIP	48-pin DIP	48-pin DIP	40-pin DIP
Address Range	1 MB, segmented	16MB, linear	8 MB, segmented	16MB, linear	256KB/16MB
General Purpose Registers	8 × 8 bit or 4 × 16 bit	8 × 32 bit	14 × 16 bit or 7 × 32 bit	8 × 32 bit	16 × 16 bit in "Macrostore"
Coprocessor	8087	68881 (1983:4Q)	Planned	16081	Planned
Price (Quantities of 100)	5MHz/ $47.50 8MHz/ $59.40 10MHz/ $95.00	4,6MHz/$56 10MHz/$61 12.5MHz/$111	6MHz/ $46.67	10MHz/$162	24MHz/$65

32-bit-long data items. This is important because floating point items are usually at least 32 bits long. While floating point (as well as decimal and possible trigonometric and transcendental) arithmetic is typically performed on a separate slave processor, such as the Intel 8087, the main processor should also be able to handle such data items.

Finally, a typical superchip is fast. While the fastest 8-bit micro today (Zilog's Z80B) runs at 8MHz, some superchips are now available in 10- and 12MHz versions. While performance is not always linearly related to clock rate (it depends for one thing on whether the clock is multiphased or not), it is generally true that, within the same family, a faster clock rate allows proportionately faster performance. An important consideration here is whether the memory and support chips can also run effectively at the MPU's clock rate.

The 16/32-bit superchip is a key ingredient of the supermicro system, but is not the only one. Another is the 64K-bit RAM chip. Considering today's buyer's market in these dense memories, it's easy to forget how scarce they were only three years ago. With these chips, a system designer can put a half-megabyte memory system on a small Multibus-type board, or 1 megabyte, possibly with full error checking, on a Data General-type printed-circuit board.

Still another ingredient is the Winchester disk drive, a product in which dramatic progress is being made at a very rapid pace. Compact 5¼-inch Winchester drives are routinely available in capacities of up to 20 megabytes; recently announced 30- to 50-megabyte capacities in the 5¼-inch package should become available later this year. Removable Winchester cartridges, which neatly bypass the disk backup problem, are also beginning to emerge.

RAPIDLY DROPPING PRICES

Other contributing factors are involved. Universal terminal line-handling chips (USARTs) take care of the nasty bit-banging chores involved in managing communications protocols, thereby permitting the system to support a significant number of user terminals without imposing inordinate requirements for board space and cpu overhead. The rapidly dropping prices of crt terminals, for example, are already at the $600 level (including ADDS and Tandy, to name just two). These two terminals could possibly reach $100 if the French Telematique/videotex program succeeds in meeting its ambitious objectives. The new breed of high-performance dot matrix printers, available from IDS, Anadex, and others, produces draft-quality print at 200 to 300 characters per second while slowing down to 100 to 150 cps for almost letter-quality work. In addition, the printers support bit-map graphics and sometimes even color. All this at a price quite similar to that of much slower, far less flexible daisywheel printers.

The combined impact of these developments is that it is no longer particularly challenging to put together a powerful 16/32-bit computer system, possibly with significant floating-point arithmetic capability, with as much as a megabyte or more of main memory and 20 megabytes or more of hard disk, all in a very compact desktop package, and all at an end-user price of around $10,000 to $15,000. There you have it: a supermicro!

We are already beginning to see chips and chip sets that are substantially more powerful than today's superchips. The 10MHz Intel 286, for example, will incorporate virtual memory management on a chip. This task is typically accomplished with a separate memory management unit chip in today's MPU offerings.

True 32-bit extensions for the Motorola 68000 and National NS16000 families have already been announced. These chips, to be available in late 1983, will augment their internal 32-bit architecture with a 32-bit-wide external data bus. They will, of course, require more pins. The Motorola 32-bitter, for example, will have 100 pins. Similar offerings from Intel and Zilog are also in the works.

The recently announced HP9000 desktop computer from Hewlett-Packard is based on a 32-bit chip set developed at the company's Ft. Collins, Colo., facility. The system's key component is a very dense (450,000 transistors, 1.5/1-micron geometry) 32-bit cpu chip. The 18-MHz (2-phase) cpu is supported by a 128K-bit memory chip and several other parts, all implemented in the same 1.5/1-micron NMOS technology. HP is unlikely to release these parts in conventional packaging.

Bell Laboratories' engineers have also made disclosures relating to their 32-bit CMOS cpu chip. Bell Labs may be preparing to market the product, called Bellmac 32, outside the Bell system. The recent relaxation in the regulatory environment (FCC's Computer Inquiry II and the AT&T/DOJ 1982 Consent Decree) makes this even more likely.

Another of these super-super (hyper?) chips is the Intel 432 MicroMainframe. This three-chip cpu set has much of the flavor of a large mainframe, even though its external bus is only 16 bits wide. For one thing, the architecture supports a very large (2-gigabyte) address space. In addition, the design lends itself especially well to the creation of a multiprocessing system: each 432 cpu set is self-dispatching and supports interprocess communications primitives. No one cpu need be in control, and the application programs need not be aware of how many processors are actually configured. Finally, the 432 incorporates Functional Redundancy Checking (FRC), a scheme that permits any two identical chips in the 432 family to be configured as a self-checking module. FRC is especially valuable in the construction of fault-tolerant systems.

In late 1982, NCR released a true 32-bit chip set for oem and internal uses. The NCR/32 features external micro-programmability, an important consideration for customizers, and IBM 370-compatibility features, which should interest IBM plug-compatible machine manufacturers.

THIRD-PARTY SOFTWARE

Portable software has been a dream of computer users since the early days of digital computers. The dream is now nearer to reality because of the polarization of the minicomputer and microcomputer markets around a few MPU families. This polarization creates the necessary environment for the growth of third-party software vendors, a significant industry in itself, and a critical catalyst for the continued development of the hardware market.

We have an excellent example of what the future holds in today's CP/M, which by some estimates was installed at approximately 500,000 sites at the end of 1982. This huge base was made possible by the popularity of the largely compatible 8080/8085/Z80 MPU families, which endowed numerous makes and models of microcomputers with essentially the same instruction repertoire. CP/M, which is written in 8080 machine code, carefully separates those functions that depend on the idiosyncracies of each implementation (crt, keyboard, peripherals) so that vendors of varying 8080/8085/Z80-based machines can readily adopt this operating system to their product.

CP/M's success, in turn, has given rise to a vigorous third-party software industry, which is reckoned by some to consist of more than 500 suppliers marketing over 3,000 CP/M compatible programs.

A similar polarization is taking place in the supermicro arena, where the main battle is between Intel's 8086 and 286 and Motorola's 68000. Digital Research is determined to capture a significant portion of the supermicro software market with CP/M-86, an extended CP/M version that runs on, and takes advantage of, the Intel 8086 (CP/M-86), and with MP/M-86 and CP/Net, which provide multitasking, multi-user, and networking extensions. Gary Kildall's Digital Research is also working on a version of CP/M to run on the 68000, and another extension for the National NS16016, a bridge machine with 8080-compatibility, due in the fall of 1983.

A bandwagon effect is building around the Unix operating system, however, especially among builders of 68000 and Z8000-based systems. Unix, which was developed at Bell Labs, is much richer than CP/M. It is also better suited to the 16/32-bit environment, and is intended to be a multi-user system (which CP/M is not). The price one pays for these features is in the main-memory requirements: 128K to 256K bytes minimum for Unix, as compared to 12K to 24K bytes for CP/M.

Unix is also attractive because it is coded largely in a high-level language called C, for which compilers exist on a fair number of mainframes, minis, and now micros (including those based on the 68000, 8086, and Z8000). Thus Unix is relatively easy to transport (or "port," as the term is commonly abbreviated) from its DEC PDP-11 and VAX versions to the supermicros. Unix is still far behind CP/M in terms of installations (fewer than 10,000 Unix installations) and of third-party support (nearly nonexistent). Yet some

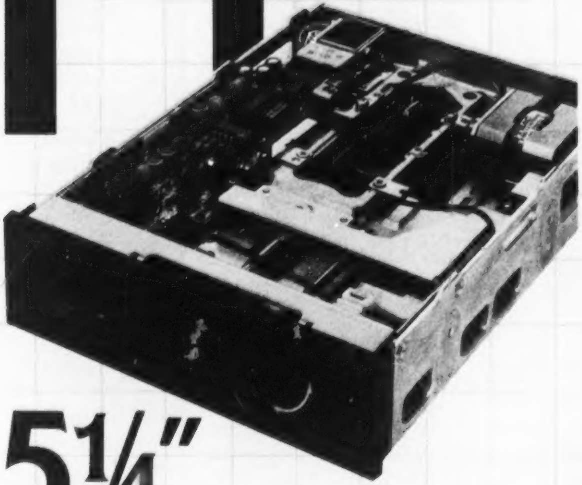

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TABLE II

SUPERMICRO MARKET PROJECTIONS FOR U.S. MFRS.

(1981 $ MILLIONS, END-USER LEVEL)

WORLDWIDE	**1982**	**1983**	**1984**	**1985**	**1986**
HARDWARE					
New shipments	300	900	1,560	1,980	2,115
Aftermarket	60	240	600	760	1,230
TOTAL HARDWARE	360	1,140	2,160	2,740	3,345
SOFTWARE					
Shipped with new systems	20	60	84	90	70
Aftermarket	20	80	200	380	615
TOTAL SOFTWARE	40	140	284	470	685
MEDIA & SUPPLIES	40	160	400	760	1,230
MAINTENANCE	7	30	80	160	271
TOTAL WORLDWIDE MARKET	447	1,470	2,924	4,130	5,530
U.S. SHARE	**1982**	**1983**	**1984**	**1985**	**1986**
HARDWARE					
New shipments	270	720	1,092	1,188	1,058
Aftermarket	54	198	450	516	750
TOTAL HARDWARE	324	918	1,542	1,704	1,808
SOFTWARE					
Shipped with new systems	18	48	59	54	35
Aftermarket	18	66	150	258	375
TOTAL SOFTWARE	36	114	209	312	410
MEDIA & SUPPLIES	36	132	300	516	751
MAINTENANCE	6	25	60	108	165
TOTAL U.S. MARKET	402	1,189	2,111	2,640	3,134

SOURCE: THE SUPERMICRO MARKET STUDY BY ITOM INTERNATIONAL CO.

industry observers are bullish on Unix: one recently projected a $9 billion market in Unix-based systems by 1985.

There are other operating system alternatives for supermicro builders and users. Some, like the UCSD p-System and the Pick system, are also portable because they basically postulate a virtual machine as the interface between the software components and the actual hardware. Once the code is written to support this virtual machine on a given real machine (typically via an interpreter), the rest of the system needs little conversion.

A fair number of supermicro vendors (notably Convergent Technologies) have opted to develop proprietary operating systems. They have done this despite the availability of CP/M, Unix, and other portable systems. One motivation for doing so is to attain product differentiation in a field that is rapidly taking on the characteristics of a commodity market. Because so many systems rely on the same MPUs and peripherals, they offer nearly identical capabilities. Proprietary software lets the builder or system integrator achieve some measure of uniqueness.

ENTERING THE MARKET

Any oem system integrator who wants to enter the supermicro market should realize that the market is already very crowded. The rate of announcements is accelerating.

Supermicro suppliers are proliferating for several reasons. First, the technology needed to assemble a supermicro is now widely available. Also, plenty of venture capital is available, in part due to the attractive features of R&D limited partnerships, and it favors high-technology startups. In addition, new marketing channels have been evolving over the past decade, including, most notably, the computer retail chains and individual retailer, the industrial parts distributors who move up into more sophisticated systems, and office equipment vendors, distributors, and dealers who are eager to cash in on the microcomputer boom. Finally, the availability of portable operating systems significantly reduces the software effort previously required of a manufacturer in bringing a new computer system to the market.

On the other hand, the proliferation of vendors and the increasingly commodity-like nature of their systems has already resulted in price cuts and rapidly dropping margins. The entire micro industry is in a shake-up, aggravated by the current economic climate.

An organization that wants to capitalize on the superchip revolution now would do well to consider avenues other than general purpose or business-oriented products. Several other avenues are worth exploring.

Vertical market applications are promising because many such applications have not been explored. Many applications were previously considered unexploitable because conventional minis cost too much and 8-bit micros were not powerful enough (due especially to the lack of compact hard disks and to low cpu power). The arrival of the 16/32-bit supermicro, supported by a 5¼-inch Winchester, is changing the equation dramatically, and calls for a fresh look.

Several of the supermicro makers (notably CIE Systems, CompuThink, and Callan Data, with their 68000-based units) plan to specialize in supporting system integrators with moderate volume requirements. They offer a choice of operating systems, private labeling, and good product differentiation options. Specialized workstations, especially graphics and computer aided engineering workstations, are another niche worth exploring. The big names in the field generally offer minicomputer-based systems, which are being challenged with superchip-based (especially 68000) systems from such startups as Daisy Systems, Cadlinc, and Valid Logic.

The portable executive terminal market is currently addressed by the rather expensive and somewhat revolutionary Grid system (8086-based) at the high end of the spectrum, and by Osborne, Otrona, and others at the low, 8-bit-based end. There is a gap between the two extremes, which could be filled with superchip-based, moderately priced products. The rapid advance in 3-inch to 4-inch floppy technology is especially significant in this connection.

Fault-tolerant systems based on superchips, especially the 68000, are now (or soon will be) challenging Tandem's dominance in the high-integrity, on-line transaction processing market. Only one such system, from Stratus Computer, of Natick, Mass., is being shipped. Several more startups plan to bring products to the market throughout 1983. The potential market is huge (more than $17 billion in 1986), and the few present market participants will tap only a small portion (less than 15%) of the available market. Furthermore, the average system in this market can be priced at well over $100,000, thus presenting a clear opportunity to escape the bloody price wars in the commodity supermicro market. ◆

Omri Serlin is the president of ITOM International Co., Los Altos, Calif., which specializes in technology assessment and market impact studies. Serlin has over 21 years of experience in the computer industry, both in the U.S. and overseas.

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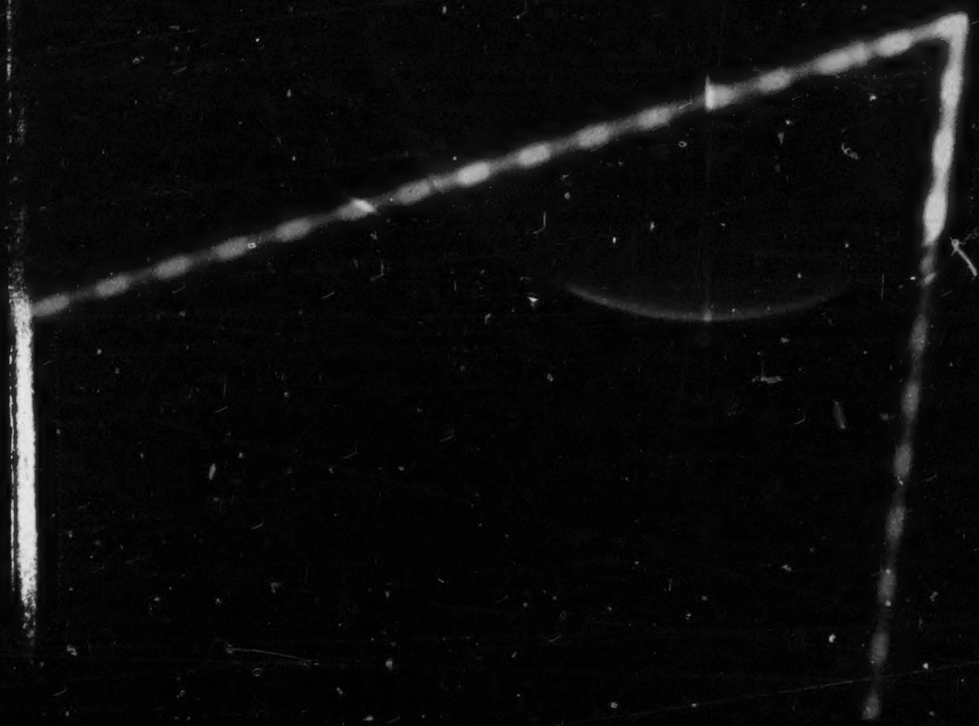
APPLICATIONS SOFTWARE SURVEY

ACADEMIA INC.

HOW TANDEM DOES IT



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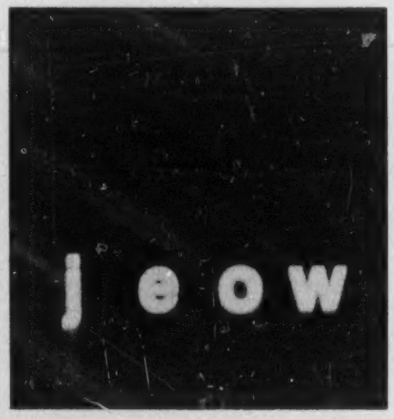

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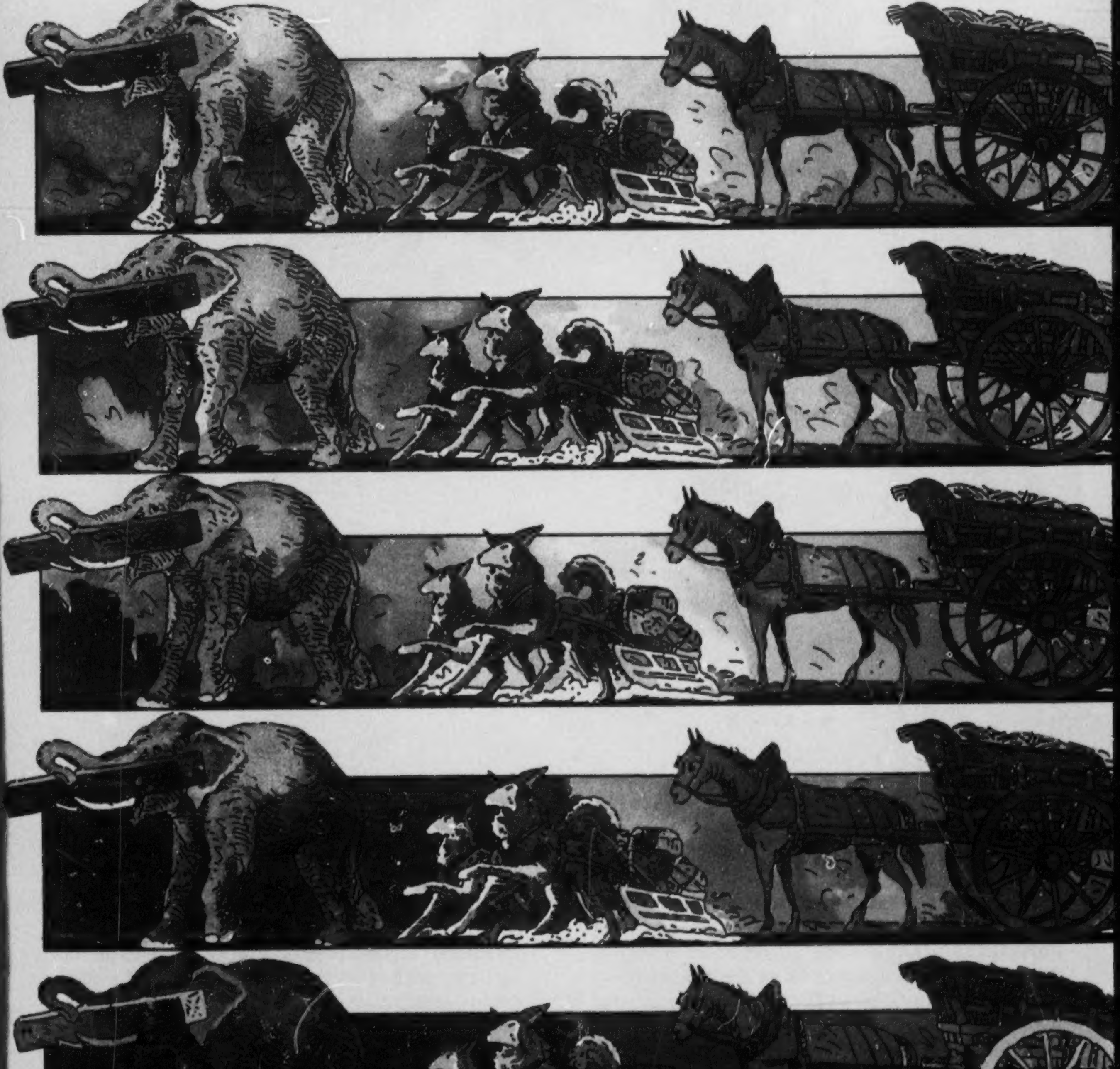
COVER PHOTOGRAPH BY PETER A. SIMON
GRAPHIC DESIGN BY CYNTHIA STODDARD

END USERS RATE APPLICATIONS SOFTWARE

While the dp department may be in charge of care and feeding, it's the people in finance, engineering, and elsewhere who actually work with these beasts of burden.



by Data Decisions

This report presents the results of a nationwide survey, conducted by Data Decisions in December 1982 and January 1983, of users known to have specific applications-oriented software packages installed. It complements a Data Decisions survey of systems software that was published in the December issue of DATAMATION.

Today, most general purpose mainframe data processing environments support a large percentage of on-line activities. Normally these activities include many of the user application packages run in the company. End users in functional work centers in various departments such as finance, personnel, and engineering are the primary parties who evaluate and select applications packages, appreciate and understand their current value, and determine the need to upgrade or replace them. Therefore, end users are the ones who should answer applications software user rating questionnaires.

We've taken this approach, and it has required that the vendors cooperate with a research organization in the conduct of the survey. Vendors were invited to provide a list of their 100 most recent customers, each of whom had the package in question installed a minimum of six months. The vendors certified that they had not deleted known unhappy customers or attempted to contact customers to influence their replies.

DATAMATION's systems and applications surveys were both conducted by Data

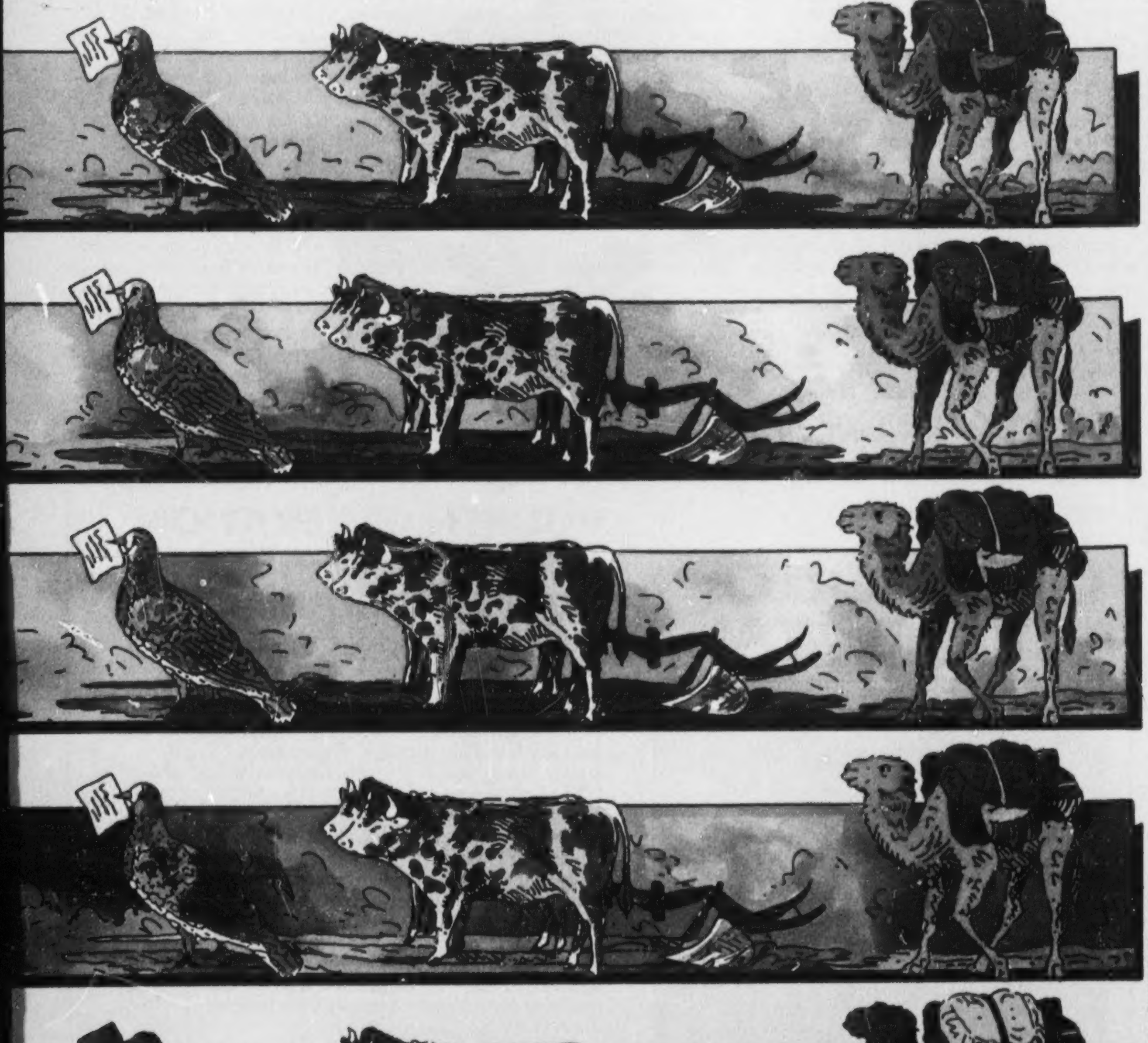


ILLUSTRATION BY BERNARD BONHOMME

Fifty-eight applications software packages were rated by more than 2,300 users.

Decisions of Cherry Hill, N.J., in conjunction with ratings reports published in Data Decisions' *Computer Systems* and *Software* edp information services. The user-site samplings were obtained directly from the applications software vendors, using International Computer Programs' (Indianapolis, Ind.) Million Dollar list as a source. Only vendors with packages identified by ICP as having grossed $5 million or more in sales were contacted for user source data.

The sample consisted of 4,653 known users of 58 applications software packages. Questionnaires were mailed during the first week in December. Telephone interviews were conducted with users of packages with low response rates to ensure that a minimum response of 40% was achieved for each package and that each package was evaluated by at least 15 users. As a result of these efforts, a total of 2,735 user responses were obtained (an overall response rate of 59%). Of this total, 2,387 are active users currently employing the packages surveyed. These users constitute the statistical base.

Users were asked to rate a specified applications package with respect to stated features, functions, and performance criteria. Four types of questions were asked. One type required only a yes or no response. The second asked users to select a phrase or phrases that defined various software performance criteria. The third type weighted user responses on a simple three-part scale. The fourth and most specific type required the user to assign a performance rating, based on a scale ranging from 10 to 9 for superior down to 2 or 1 for inadequate, to characteristics related to package use and operation, vendor service, and overall satisfaction.

A synthesis of the responses from 2,387 active users showed the following:

Buying Influences

An overwhelming 87% of users of the average package studied indicated that software features and functions were major influences in their decision to acquire the package. Other factors widely described as major influences were overall vendor "presence" or reputation in the industry (by 52% of users of the average package), related costs and time to implement the package by internal staff (44%), and the package's compatibility with existing software (40%).

On the other hand, 82% of users of the average package indicated that the results of benchmark runs had little or no influence on the buying decisions; 80% indicated that experience with other vendor packages also had little or no influence; and 76% said the same of consultants and third parties.

Alternative Packages

Overall, 72% of users of the average package stated that they had evaluated alternative packages before making an acquisition decision. By type of package, a high of 91% of the users of the average payroll/personnel package and a low of 54% of the users of the average business administration package evaluated alternatives.

Computer System

Sixty percent of the applications packages evaluated in this survey were run primarily on IBM hosts. Five percent were run primarily on DEC systems; 4% on Hewlett-Packard; 3% each on Texas Instruments and Burroughs; 2% each on Amdahl, Honeywell, Basic Four, Univac, and Data General; 1% on NAS; and 14% on other or unspecified hosts.

Time Installed

Overall, the average time period the applications packages were installed was 32 months, or about 2.7 years. The responses

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CIRCLE 102 ON READER CARD

About 72% of users surveyed said their packages met or exceeded vendors' performance promises.

ranged from 18% employing the average package less than one year to 4% having the package installed more than eight years.

Maintenance

Some 83% of the respondents reported that their packages were maintained by the vendor. About 14% employed an in-house staff to maintain their packages, while only 2% employed a third-party software support organization.

Replacements

Only 10% of users of the average applications package studied indicated that they were actively considering replacement of their packages. Of this number, only 12% (or 1.2% overall) cited generally unsatisfactory performance as the reason, and only 13% (1.3% overall) stated that slow execution speed was a reason for replacement. The main reason given, cited by 33% of those considering replacement (3.3% overall), was the need for features not currently incorporated into the package.

Performance vs. Promises

About 72% of the users of the average package stated that it either met or exceeded all vendor promises with respect to installation time; features and capabilities; and performance, speed, and efficiency factors. Only 4% of the users said that vendor software performance factors had not been met.

Overall Satisfaction

Users were also asked to state their overall satisfaction with the package on a scale of 1 to 10, with 10 to 9 for superior, 8 to 6 for very good, 5 to 3 for acceptable, and 2 to 1 for inadequate. A total of 17% cited their satisfaction level as superior and 56% rated overall satisfaction as very good. A total of 23% rated overall satisfaction as acceptable and about 2% rated it inadequate.

HOW THEY RATE

The following bar charts show how each package was rated with regard to overall satisfaction, installation and initial use, vendor service and support, operations, and input/output criteria. Graphs are presented for all 58 applications software packages that were sampled.

Bar charts are also included for both the total survey and for the individual group averages. Additional information included with each chart cites the total number of responses, the number of users rating the package outstanding, the number actively considering replacing the package for any reason, and the number seeking replacement for generally unsatisfactory performance. The bar charts show ratings of superior (10 to 9), very good (8 to 6), and acceptable (5 to 4). Ratings under 4 are not graphed.

The *Overall Satisfaction* bar encompasses factors such as satisfaction with package features, capabilities, and utility; frequency of failures requiring special effort for recovery; and vendor installation, documentation, modification, and training support.

The bar labeled *Installation and Initial Use* is a composite that includes freedom from bugs/errors, time required for initial installation, ease of implementation, and quality of documentation and training.

The bar labeled *Vendor Service* gauges the vendor's speed and thoroughness in fixing bugs/errors, the quality of vendor program modifications, and the frequency of package updating.

The *Operations* bar is a measure of the package's ability to handle expanding processing volumes and an evaluation of initiation/calling and backup/recovery procedures.

(Special note: in split-bar presentations, the solid bar indicates the package's scores; the open bar denotes the common group average.)

NINE PACKAGE GROUPS

The 58 packages covered in this study have been grouped into nine categories for more meaningful averaging and comparison:

- *General Accounting Packages:* applications software for general ledger, accounts receivable, accounts payable, fixed asset, and integrated accounting systems.
- *Other Accounting Packages:* tax, financial, construction, and petroleum account software.
- *Banking and Finance Packages:* systems dealing with general banking, savings and loan, deposit, and financial planning and control applications.
- *Insurance Applications Packages:* general insurance, claims management, accounting, and policy management software.
- *Manufacturing Packages:* integrated manufacturing control, material requirements processing, production distribution software.
- *Industrial Management Applications Packages:* inventory and distribution management, management control systems.
- *Project Management Packages:* project planning and control, and simulation/projection software.
- *Business/Office Administration Packages:* audit analysis, spreadsheet business planning, and statistical simulation software.
- *Payroll/Personnel Packages:* payroll and human resources management software.

The findings presented in this report reflect user perceptions of package performance in response to the particular dimensions probed by the questionnaire. These perceptions are not intended to be all-inclusive, nor do they necessarily provide evaluations comparable to those that would be obtained under conditions of a controlled engineering test or experiment. The numbers reported are estimates within a range of what would have been obtained had all user sites in the survey universe been similarly enumerated. ●

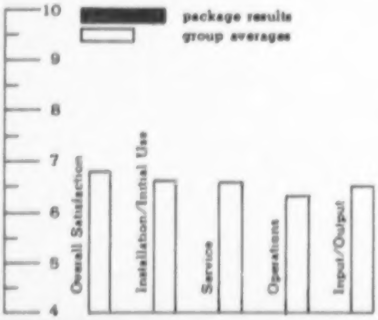
"Before he got the computer he was a guru. Now he's just a resource person."

CARTOON BY HENRY MARTIN

This survey is based on a forthcoming report in Data Decisions' *Software* service, a monthly updated loose-leaf information service covering systems and applications software. A trial review is available from Data Decisions, 20 Brace Road, Cherry Hill, NJ 08034. Telephone (609) 429-7100.

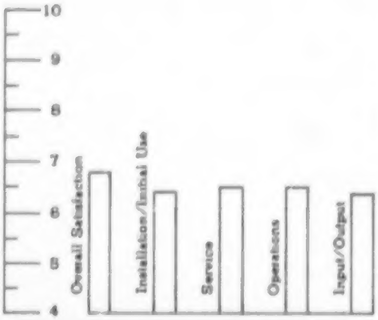
☐ OVERALL SUMMARY
Average · All Packages • 58 packages

2,387 responses • 42% of users judged features/capabilities outstanding • 10% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



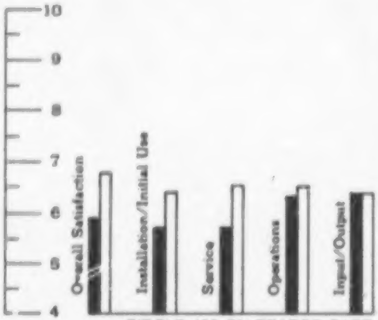
☐ GENERAL ACCOUNTING PACKAGES
Group Average • 14 packages

748 responses • 38% of users judged features/capabilities outstanding • 9% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



PROFIT • Computer Methods Incorporated, 9401 West Beloit Road, Milwaukee, WI 53227 • 414-327-4471

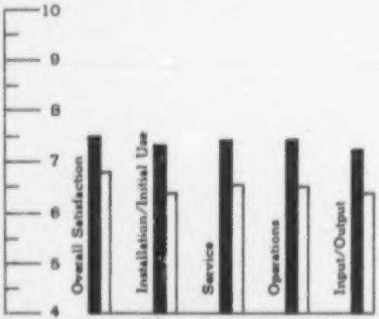
47 responses • 11 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 400 ON READER CARD

CUSTOMAR • Computeristics Incorporated, 2 Skiff Street, Hamden, CT 06514 • 203-288-4885

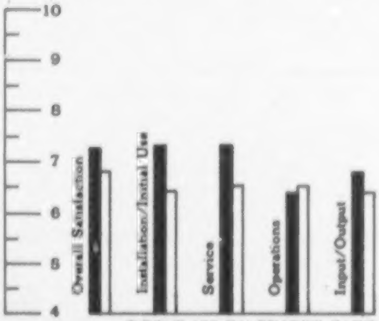
36 responses • 17 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 401 ON READER CARD

FIXED ASSETS ACCOUNTING SYSTEM • Data Design Associates, 1250 Oakmead Parkway, Suite 310, Sunnyvale, CA 94086 • 408-730-0100

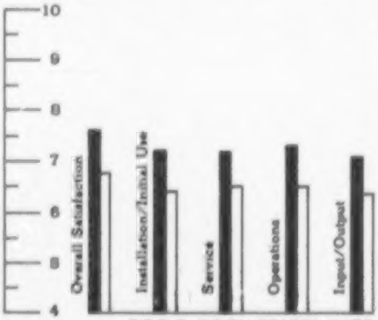
66 responses • 28 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 402 ON READER CARD

DISC ACCOUNT RECONCILIATION PACKAGE (ARP) • Disc Incorporated, 3837 Naylors Lane, Baltimore, MD 21208 • 301-486-0410

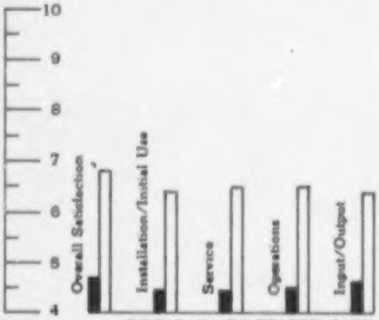
46 responses • 27 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 403 ON READER CARD

ACCOUNTS PAYABLE SYSTEM • Global Software Incorporated, 1009 Spring Forest Road, Raleigh, NC 27609 • 919-872-7800

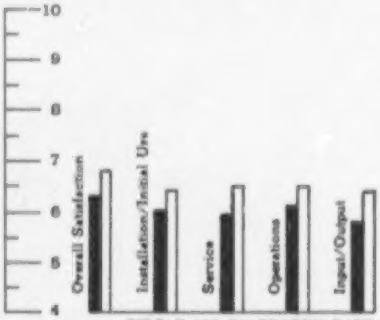
38 responses • 2 users judged features/capabilities outstanding • 12 users actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



CIRCLE 404 ON READER CARD

GENERAL LEDGER & FINANCIAL REPORTING SYSTEM • Global Software Incorporated, 1009 Spring Forest Road, Raleigh, NC 27609 • 919-872-7800

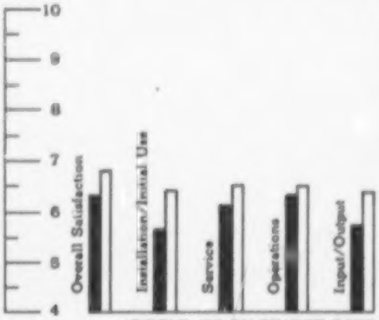
94 responses • 19 users judged features/capabilities outstanding • 10 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 405 ON READER CARD

A/P PLUS • McCormack & Dodge Corporation, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

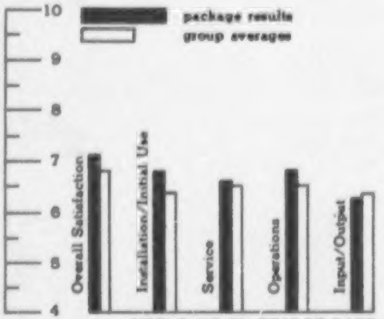
41 responses • 14 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 406 ON READER CARD

F/A PLUS • McCormack & Dodge Corporation, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

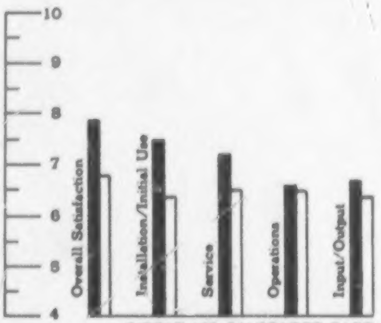
58 responses • 22 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 407 ON READER CARD

G/L PLUS • McCormack & Dodge Corporation, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

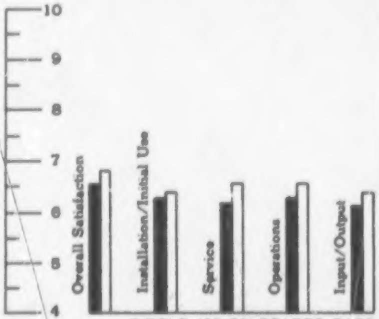
65 responses • 37 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 408 ON READER CARD

MSA ACCOUNTS PAYABLE • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

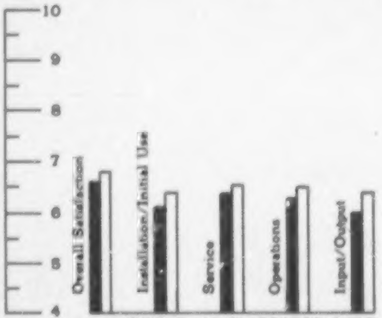
58 responses • 19 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 409 ON READER CARD

MSA ACCOUNTS RECEIVABLE • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

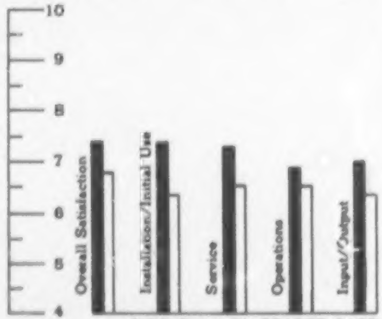
39 responses • 13 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 410 ON READER CARD

MSA FIXED ASSETS ACCOUNTING SYSTEM • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

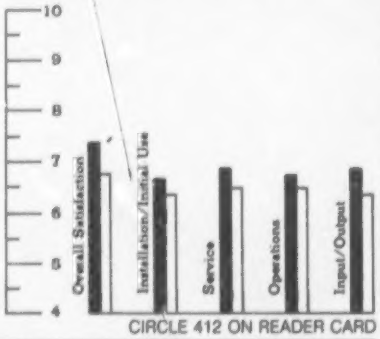
49 responses • 17 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 411 ON READER CARD

MSA GENERAL LEDGER • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

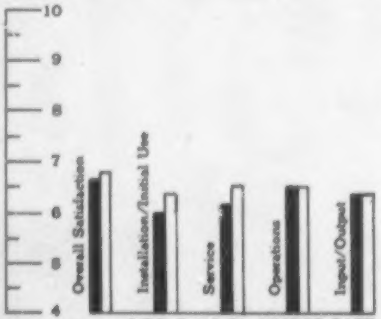
67 responses • 40 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 412 ON READER CARD

GENERAL LEDGER & FINANCIAL REPORTING • Software International Corporation, 1 Tech Drive, Andover, MA 01810 • 617-685-1400

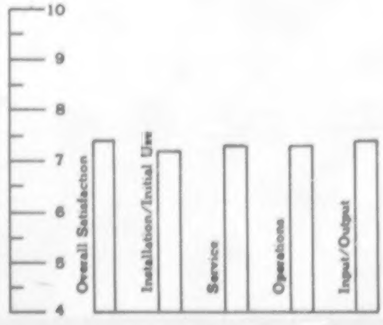
47 responses • 20 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 413 ON READER CARD

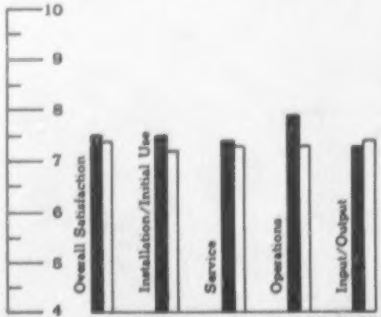
☐ **OTHER ACCOUNTING PACKAGES**
Group Average • 6 packages

250 responses • 53% of users judged features/capabilities outstanding • 11% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



SYSTEM 5 • Construction Computer Control Corporation, 615 East Michigan Street, Milwaukee, WI 53202 • 414-278-0500

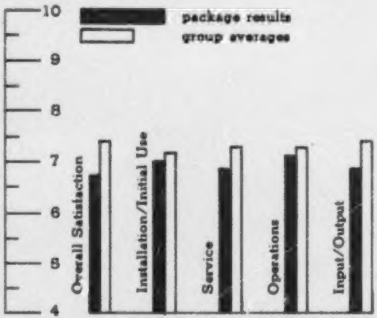
43 responses • 19 users judged features/capabilities outstanding • 7 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



*CIRCLE 414 ON READER CARD.

PASHAL PETROLEUM ACCOUNTING SYSTEM • HAL Systems & Services, 5339 Alpha Road, Suite 100, Dallas, TX 75240 • 214-385-2300

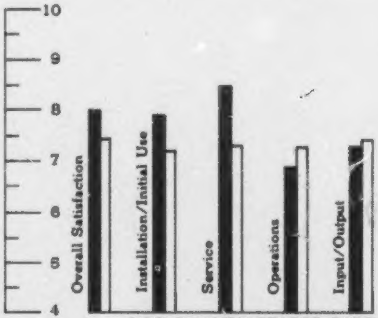
21 responses • 8 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 415 ON READER CARD

MSA ALLTAX • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

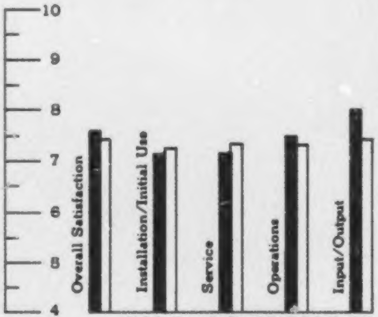
52 responses • 24 users judged features/capabilities outstanding • 9 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 416 ON READER CARD

MAC (Management Accounting for Construction) • Timberline Systems Incorporated, 10550 Southwest Allen Boulevard, Suite 220, Beaverton, OR 97005 • 503-643-9461

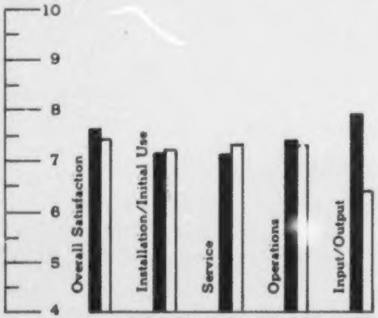
29 responses • 19 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 417 ON READER CARD

CLIENT ACCOUNTING SYSTEM • Tymshare Incorporated, 6655 Southwest Hampton, Tigard, OR 97223 • 503-684-1351

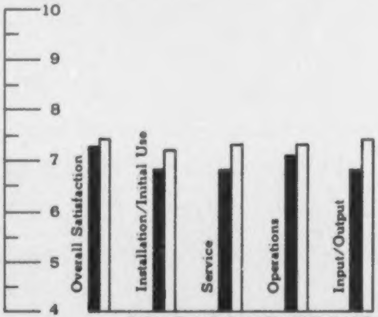
55 responses • 36 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 418 ON READER CARD

FINANCIAL ACCOUNTING SYSTEM • Westinghouse Information Services, PO Box 30, Iowa City, IO 52244 • 319-354-9200 ext. 142

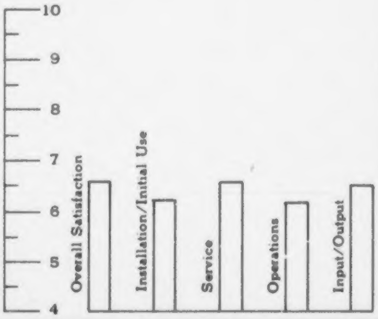
50 responses • 28 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 419 ON READER CARD

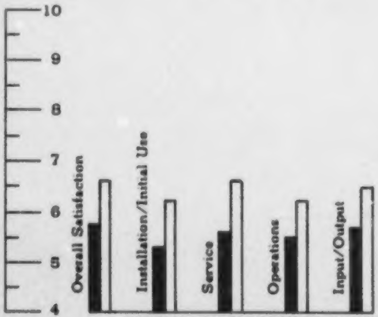
☐ **BANKING/FINANCE PACKAGES**
Group Average • 8 packages

217 responses • 44% of users judged features/capabilities outstanding • 16% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



ONLINE BANKING SYSTEM • Bob White Computing & Software, 830 Diane Lane, Naperville, IL 60540 • 312-961-3350

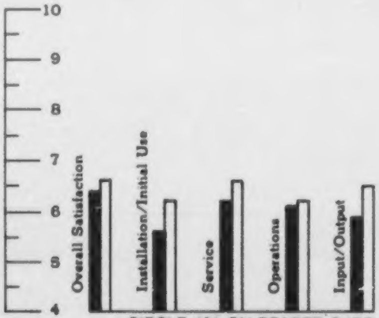
15 responses • 3 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 420 ON READER CARD

THE CANTON SYSTEM/80 • Citizens Automated System, 100 South Central Plaza, Canton, OH 44702 • 216-489-3600

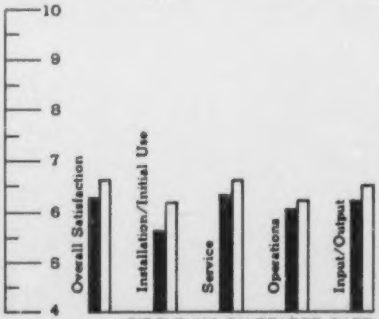
19 responses • 4 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 421 ON READER CARD

PRO-TRUST SYSTEMS • Dyatron Corporation/General Systems Division, PO Box 235, Birmingham, AL 35201 • 205-956-7500

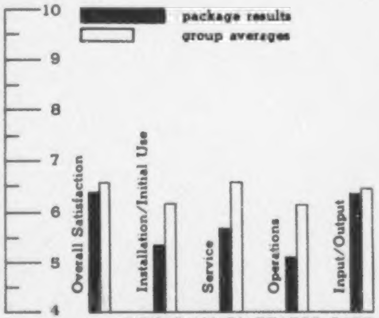
16 responses • 4 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 422 ON READER CARD

INTEGRATED DEPOSITS SYSTEMS • Hogan Systems Incorporated, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-688-1675

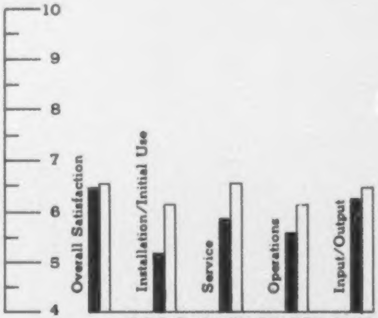
17 responses • 12 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 423 ON READER CARD

TRANSACTION SYSTEMS DEPOSITS • Hogan Systems Incorporated, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-688-1675

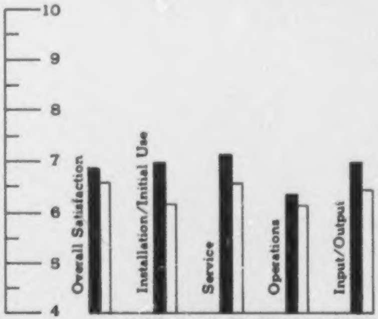
16 responses • 9 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 424 ON READER CARD

SAVINGS & LOAN PACKAGE • Remote Computing Corporation, 1076 East Meadow Circle, Palo Alto, CA 94303 • 415-494-6111

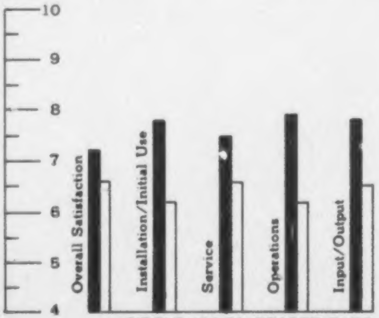
30 responses • 9 users judged features/capabilities outstanding • 14 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 425 ON READER CARD

FINANCIAL PLANNING & CONTROL SYSTEM • Saddlebrook Corporation, 76 Rogers Street, Cambridge, MA 02142 • 617-661-8100

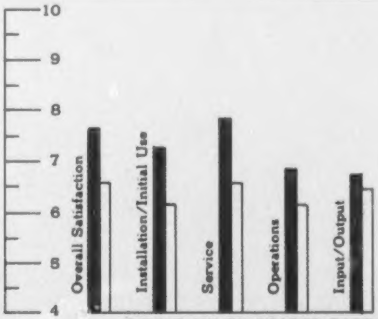
42 responses • 29 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 426 ON READER CARD

PEP • Stockholder Systems Incorporated, 1965 North Park Place, Atlanta, GA 30339 • 404-952-EFTS

62 responses • 35 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.

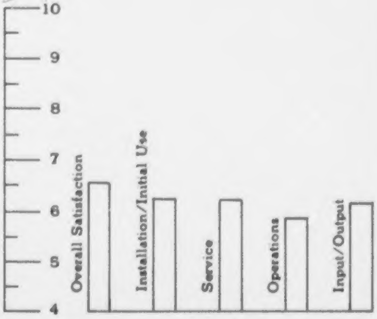


CIRCLE 427 ON READER CARD

9

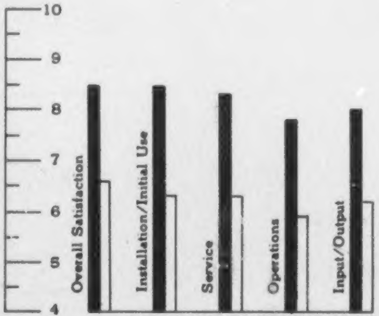
☐ INSURANCE PACKAGES
Group Average • 7 packages

209 responses • 38% of users judged features/capabilities outstanding • 6% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



CLAIMFACTS • Erisco Incorporated, 1700 Broadway, New York, NY 10019 • 212-247-2444

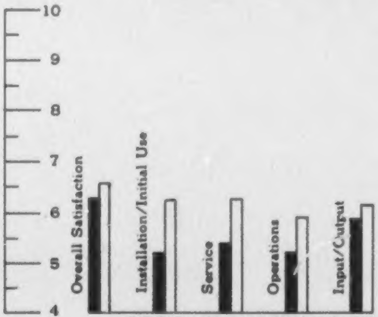
15 responses • 11 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 428 ON READER CARD

LIFE-COMM • Informatics General Corporation, 21031 Ventura Boulevard, Suite 800, Woodland Hills, CA 91364 • 213-887-9040

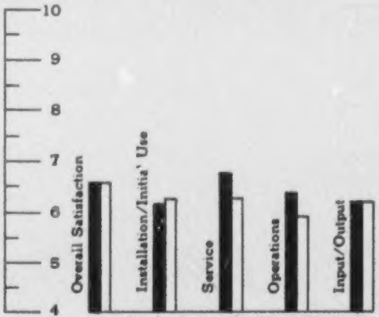
34 responses • 13 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 429 ON READER CARD

ACCOUNTING BUDGET & COST SYSTEM • Information Systems of America, PO Box 47975, Atlanta, GA 30362 • 404-441-8800

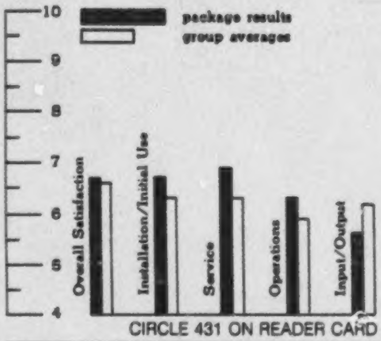
46 responses • 14 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 430 ON READER CARD

BOND & STOCK SYSTEM • Information Systems of America, PO Box 47975, Atlanta, GA 30362 • 404-441-8800

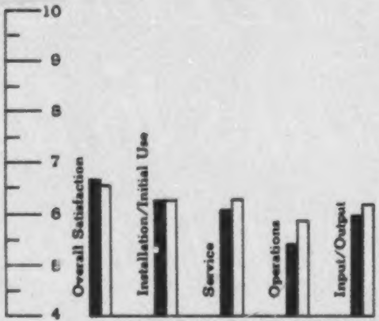
67 responses • 19 users judged features/capabilities outstanding • 8 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 431 ON READER CARD

CREDIT LIFE ADMINISTRATION SYSTEM • Logic Incorporated, 2720 Stemmons Freeway, 1100 Stemmons Tower South, Dallas, TX 75207 • 214-630-6131

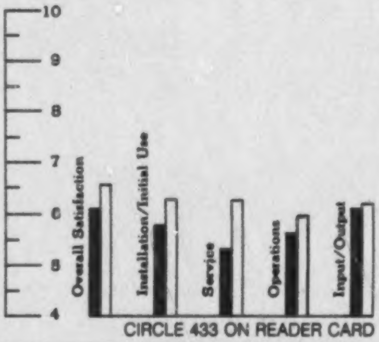
15 responses • 7 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 432 ON READER CARD

PALLM-LIFE • PALLM Incorporated, 2606 Fortune Circle, East Drive, Indianapolis, IN 46241 • 317-243-7591

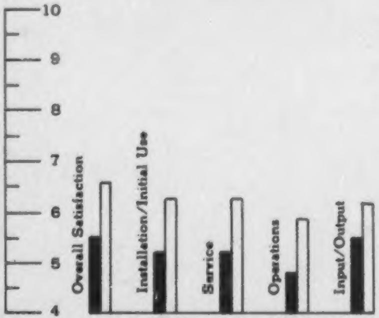
17 responses • 5 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 433 ON READER CARD

INSURANCE MANAGEMENT INFORMATION SYSTEM • Policy Management Systems Corporation, PO Box 10, Columbia, SC 29202 • 803-748-2000

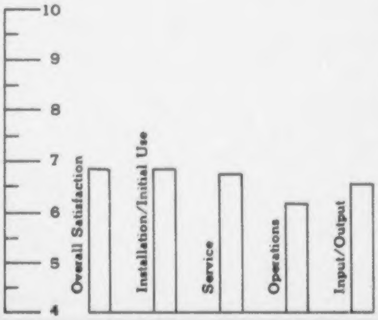
15 responses • 3 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 434 ON READER CARD

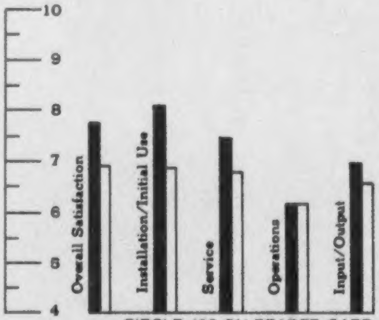
☐ **MANUFACTURING PACKAGES**
Group Average • 5 packages

207 responses • 46% of users judged features/capabilities outstanding • 13% of users actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



MANMAN • Ask Computer Systems Incorporated, 730 Distel Drive, Los Altos, CA 94022 • 415-969-4442

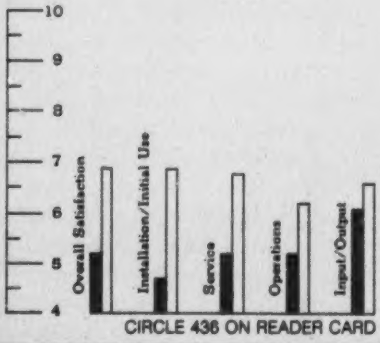
65 responses • 33 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 435 ON READER CARD

MINI-MIZ • Automated Quill Incorporated, Top Floor, 3501 South Corona Street, Englewood, CO 80110 • 303-761-2722

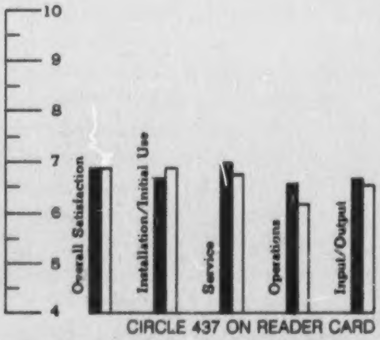
29 responses • 4 users judged features/capabilities outstanding • 9 users actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



CIRCLE 436 ON READER CARD

MRPS • Cincom Systems Incorporated, 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

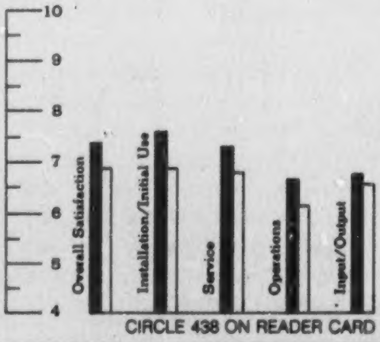
15 responses • 8 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 437 ON READER CARD

UNIVATION • Management Science Incorporated, 4321 West College Avenue, Appleton, WI 45914 • 414-739-3616

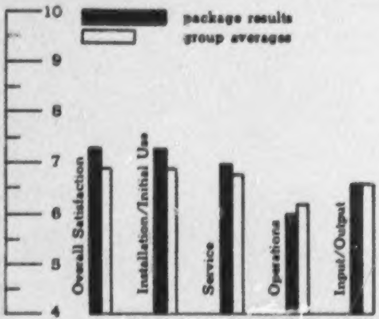
57 responses • 36 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 438 ON READER CARD

MAXCIM • NCA Corporation, 388 Oakmead Parkway, Sunnyvale, CA 94086 • 408-245-7990

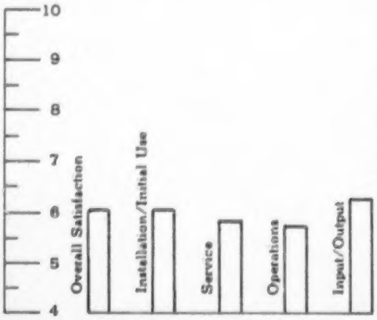
41 responses • 21 users judged features/capabilities outstanding • 7 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 439 ON READER CARD

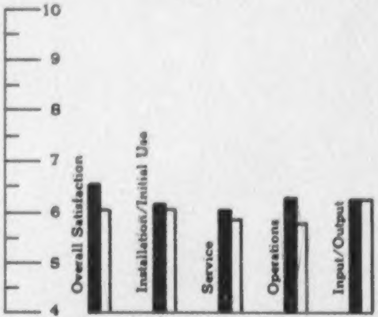
☐ INDUSTRIAL MANAGEMENT PACKAGES
Group Average • 5 packages

104 responses • 40% of users judged features/capabilities outstanding • 7% of users actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INVENTORY MANAGEMENT SYSTEM • American Software Incorporated, 443 East Paces Ferry Road, Atlanta, GA 30305 • 404-261-4381

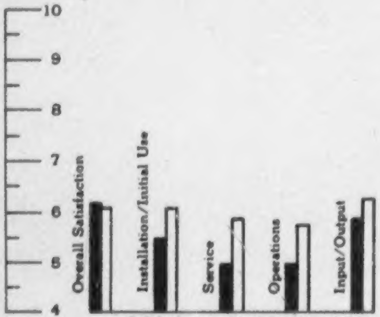
15 responses • 9 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 440 ON READER CARD

DMS • Distribution Management Systems, 81 Hartwell Avenue, Lexington, MA 02173 • 617-863-5000

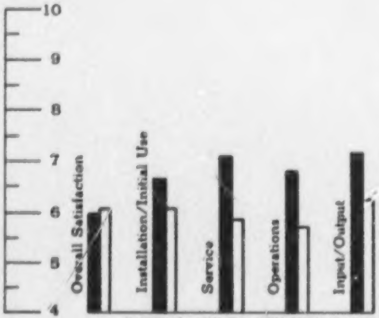
17 responses • 7 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 441 ON READER CARD

IMCS • Interactive Information Systems, 10 Knollcrest Drive, Cincinnati, OH 45237 • 513-761-0132

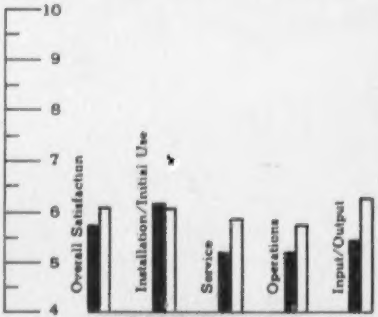
16 responses • 7 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 442 ON READER CARD

MSA INVENTORY & PURCHASING SYSTEM • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

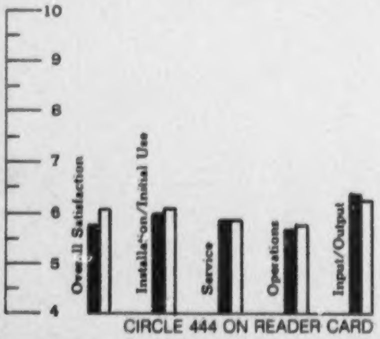
41 responses • 6 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 443 ON READER CARD

CIDS • Rand Information Systems, 98 Battery Street, San Francisco, CA 94111 • 415-392-2500

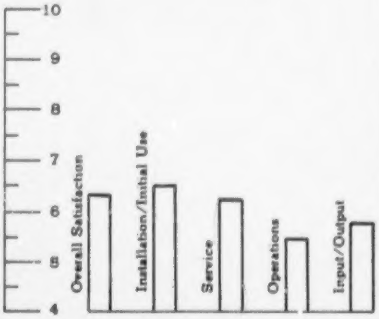
15 responses • 6 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 444 ON READER CARD

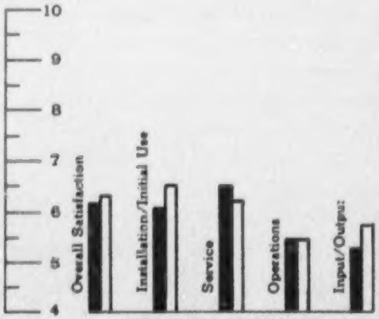
☐ PROJECT MANAGEMENT PACKAGES
Group Average • 3 packages

179 responses • 34% of users judged features/capabilities outstanding • 13% of users actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



PAC SYSTEM • AGS Management Systems, 890 Valley Forge Plaza, King of Prussia, PA 19406 • 215-265-1550

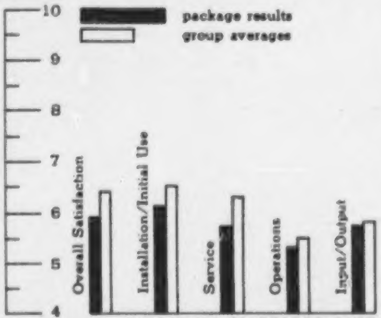
59 responses • 16 users judged features/capabilitier outstanding • 5 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 445 ON READER CARD

N5500 PROJECT PLANNING & CONTROL SYSTEM • Nichols & Company Incorporated, 5839 Green Valley Circle, Suite 104, Culver City, CA 90230 • 213-670-6400

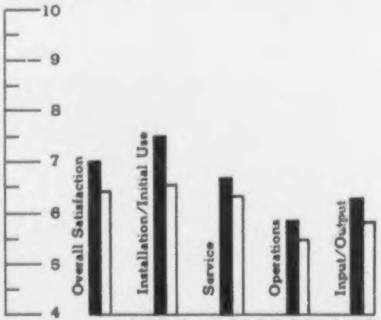
54 responses • 16 users judged features/capabilities outstanding • 8 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 446 ON READER CARD

FORESIGHT • United Information Services, 5454 West 110th Street, Overland Park, KS 66211 • 913-341-9161

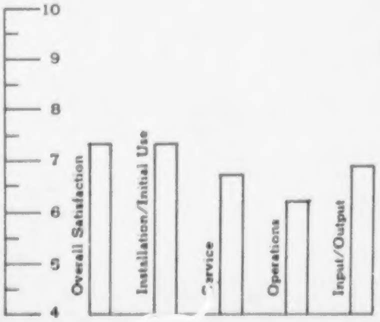
66 responses • 29 users judged features/capabilities outstanding • 11 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 447 ON READER CARD

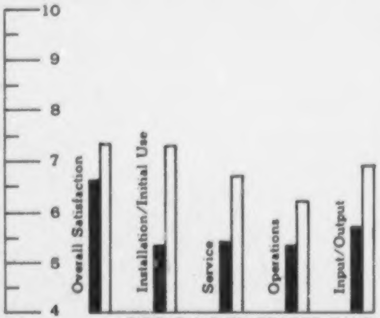
☐ **BUSINESS/OFFICE ADMINISTRATION PACKAGES**
Group Average • 6 packages

262 responses • 45% of users judged features/capabilities outstanding • 11% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



SALES FORECASTING SYSTEM • American Software Incorporated, 443 East Paces Ferry Road, Atlanta, GA 30305 • 404-261-4381

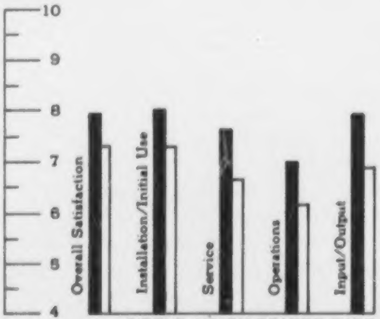
25 responses • 15 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 448 ON READER CARD

EDP AUDITOR • Cullinane Database Systems Incorporated, 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

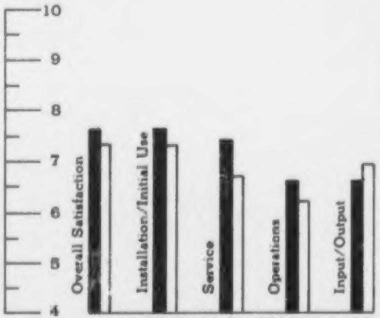
35 responses • 20 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 449 ON READER CARD

CARRIER ROUTE CODING SYSTEM • List Processing Company Incorporated, 555 Waters Edge, Lombard, IL 60148 • 312-932-7000

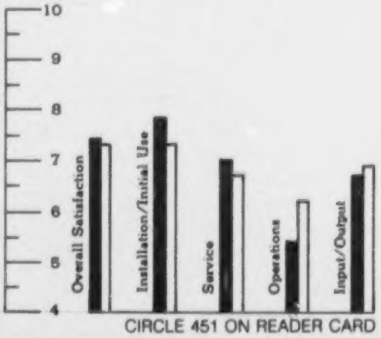
64 responses • 30 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 450 ON READER CARD

SPSS BATCH SYSTEM • SPSS Incorporated, 444 North Michigan Avenue, Suite 3000, Chicago, IL 60611 • 312-329-2400

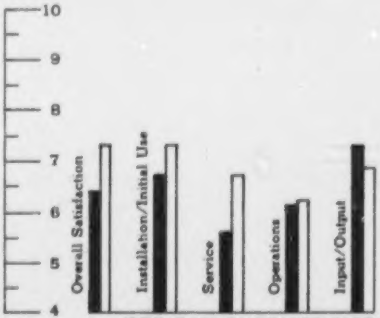
67 responses • 28 users judged features/capabilities outstanding • 8 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 451 ON READER CARD

THE AUDIT ANALYZER • TSI International, 50 Washington Street, Norwalk, CT 06854 • 203-853-2884

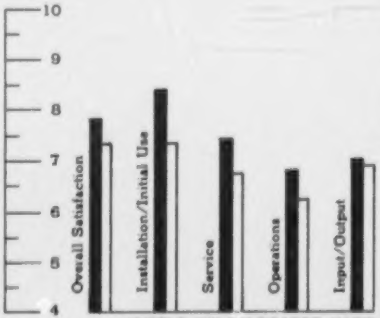
40 responses • 12 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 452 ON READER CARD

VISICALC • Visicorp, 2895 Zanker Road, San Jose, CA 95134 • 408-946-9000

31 responses • 11 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.

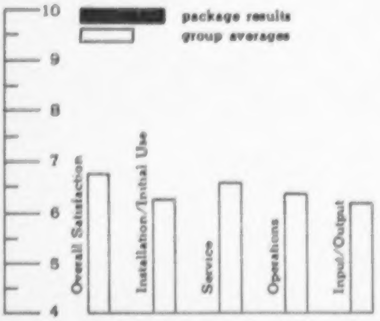


CIRCLE 453 ON READER CARD

☐ PAYROLL/PERSONNEL PACKAGES

Group Average • 4 packages

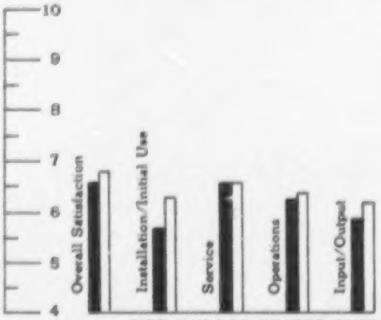
211 responses • 42% of users judged features/capabilities outstanding • 7% of users actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



CYBORG PAYROLL/PERSONNEL SYSTEM

• Cyborg Systems Incorporated, 2 North Riverside Plaza, Suite 2160, Chicago, IL 60606 • 312-454-1865

52 responses • 17 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.

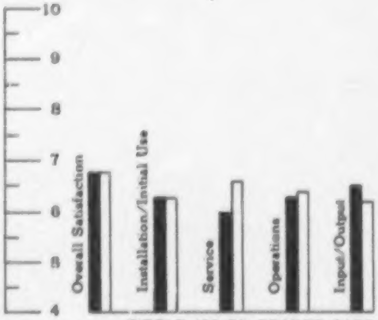


CIRCLE 454 ON READER CARD

INSCI HUMAN RESOURCE SYSTEM

• Information Science Incorporated, 95 Chestnut Ridge Road, Montvale, NJ 07645 • 201-391-1600

57 responses • 21 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.

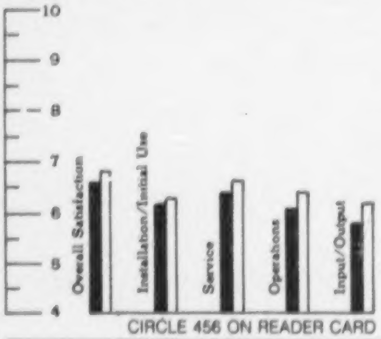


CIRCLE 455 ON READER CARD

MSA PAYROLL SYSTEM

• Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

57 responses • 22 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.

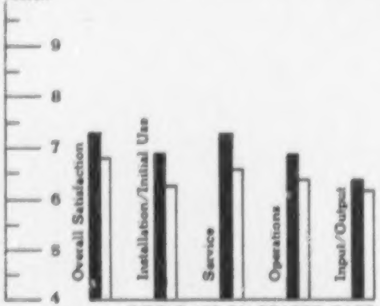


CIRCLE 456 ON READER CARD

MSA PERSONNEL AND REPORTING SYSTEM

• Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

45 responses • 27 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



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COVER BY JOAN STEINER
PHOTOGRAPH BY E. AND J. STALLER

IN FOCUS

THE CPU MARKET: A SURVEY

While IBM enjoys strong orders for its 3380 disk and 308X mainframes, the other mainframers are struggling to find business in office systems and minicomputers.

Once again IBM is showing its muscle in the annual Cowen & Co./DATAMATION survey of mainframe buying plans. The industry leader has enjoyed strong order rates during the past year and is apparently poised to gain even more ground this year on its plug-compatible rivals and the traditional mainframe competitors.

This year's survey compiles answers received from a total of 5,416 users who were asked about their installed equipment and expected order activity for the previous and following 24 months as of mid-February this year. Questionnaires were sent to users of IBM, Burroughs, Honeywell, NCR, and Univac computers.

While the survey does not pretend to speak for the entire U.S. user population, it gives a well-rounded picture of a substantial number of users and sketches out important trends that will affect product marketing and product development plans for the industry this year.

If any single overriding trend can be seen stretching across company boundaries, it is that the industry's strongest growth is no longer coming from mainframes but rather from a number of smaller, rapidly expanding markets. Among these are distributed processing, minicomputers, personal computers, office systems, software, and communications. Each of these markets was investigated in depth this year, providing an unprecedented view of how users are spending their money.

In addition, specific analysis was made this year of the implications of IBM's growing dominance in the marketplace, especially for the traditional mainframers, and the battle between the industry leader and its plug-compatible competitors.

In the fast-growing distributed data processing market, IBM's success has been especially strong. In those non-IBM user sites planning to first distribute their computing in 1983 or 1984, 14% specified IBM as the principal vendor. Of those who have already implemented ddp, fully 8% said they would use IBM primarily, compared to last year's comparable figure of 3%.

Among large systems users, distributed processing was found most pervasive among IBM sites, but it was growing fastest among Burroughs and Honeywell users. Among IBM sites in the large systems category, it was found that just over half would be using distributed processing over the next 24 months, compared to 33% already using it. By comparison, only 22% of Burroughs sites were into ddp at the time of the survey but 45% said they would have it under way in the next two years. Honeywell users indicated similar figures.

Moreover, IBM has been making strong inroads into its own and other mainframers' sites in the area of office systems. Of IBM users, almost half said they would use IBM office systems. By comparison, only 31% of Honeywell sites, 21% of NCR sites, 14% of Univac sites, and 14% of Burroughs sites said they would use their mainframer's office systems.

As a supplier of office systems and word processors, IBM earned 46% of mentions from the IBM user population, compared to Wang's follow-up figure of 21%. Some 33% of the other mentions were split into 2%, 3%, and 4% shares for CPT, Lanier/AES, Xerox, and others. In similar figures last year, IBM had a 41% share, compared to Wang's 28%. Wang's share of the office systems mentions was greater among users with annual revenues of $250 million or more, as compared to smaller users. CPT scored well (6%) with smaller organizations.

A total of 3,636 IBM sites provided information for this year's survey. Those users were found to be installing 308X machines at a rapid clip, losing interest in 303X and 4300 gear and, among other trends, rearranging their lease/purchase mixes.

In terms of total dollar value of 370-type machines installed at IBM sites, the 308X line accounted for 33%, just one point under the value of installed 303X machines. The 4300 line made up 23% of the total value while 370s now account for only 10% and 360 gear only 0.4%. Last year's comparable numbers were 8% for the 308X, 21% for the 4300 line, 46% for the 303X, and 22% for 370 machinery.

The industry's strongest growth is no longer coming from mainframes but rather from new, emerging markets.

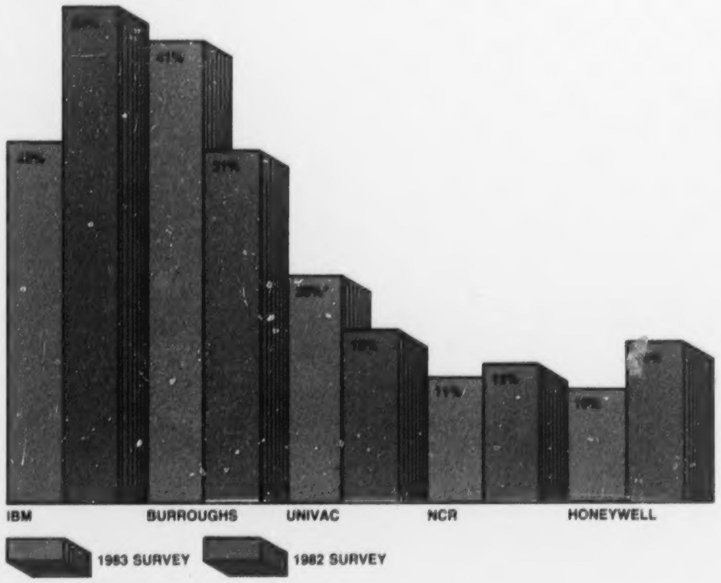
Together, the survey data suggest that between 1,100 and 1,200 IBM 308X systems are already installed in the U.S. and Canada as of the survey's cutoff date. Also, the data show how important the high end of the computer spectrum is to IBM's total sales and that the 4300 line did not turn in a spectacular year in 1982.

Meanwhile, plug-compatible manufacturers Amdahl Corp. and National Advanced Systems, selling Hitachi mainframes, appeared not to have gained any

FIG. 1

RESPONDENTS' INSTALLATION PLANS

VALUE OF PLANNED INSTALLATIONS AS PERCENTAGE OF INSTALLED BASE

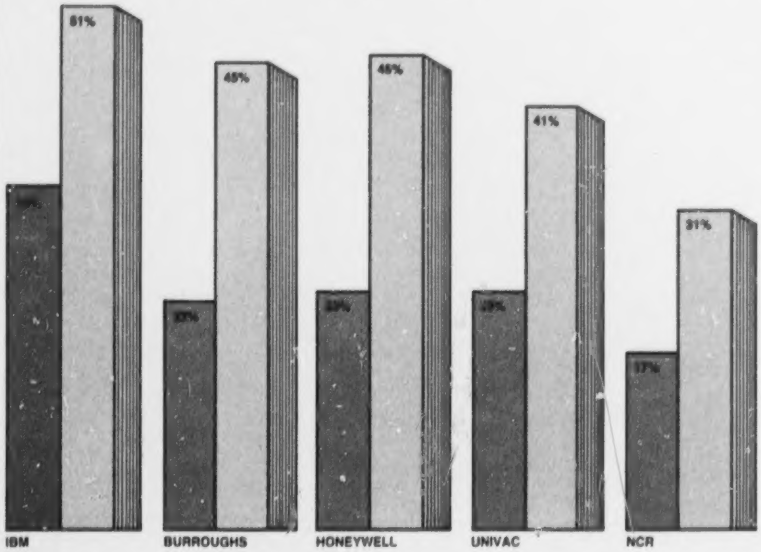


*Does not include USAF order for 153 1100/60s to be delivered in 1983 through 1985

FIG. 2

PRESENT AND PROJECTED USE OF DDP

PERCENTAGE OF LARGER SYSTEMS USERS



CHARTS BY CYNTHIA STODDARD

market share in the large-scale systems segment over last year's survey. Their combined share of total value remained just over 15%, divided as last year at 14% for Amdahl and just below 2% for NAS. It should be remembered that shipments of Amdahl's 580, delayed by engineering problems, were just beginning late in 1982 while IBM was enjoying its first full year of 3081 shipments.

Looking ahead for the next 24 months, IBM respondents said they would be installing equipment valued at 32% of their current installed machines. Only 7% of that planned spending was to be for non-308X equipment, implying that IBM will be heavily dependent on 3083 and 3084 equipment during the two year time frame. Moreover, the data suggest that the company is due soon to introduce a new line of midrange systems as a replacement for the 4300 line.

At the low end of IBM's product line, the System/38 was seen as doing particularly well, bolstering, in fact, the company's business there. In terms of dollar value, the System/38 is expected to account for more than half of the installations from formerly General Systems division machines (System/3, 32, 34, and 38). Some respondents mentioned plans to install IBM's as-yet-unannounced System/36.

IBM users are moving away from leasing and towards purchasing their systems.

For Amdahl, 470 systems continued to be the major source of installation activity, according to its respondents. Looking ahead into 1983, they said 36% of their planned Amdahl orders would be for 470 V/8 systems, 20% for other 470s, and only 44% for the oncoming 580 line. In terms of dollar value, however, the 580s will gain a majority share of orders.

The lease/purchase mix for IBM sites will see some shifts in the coming 24 months. In particular, among 308X shipments, third-party leasing will see a dramatic rise to 37% of total dollars spent from last year's outlook of 22%. Direct purchase from IBM will apparently remain level, at about 42% to 43%. Long-term leasing from IBM is on the downswing, showing only a 15% share of planned activity, compared to last year's figure of 32%. These changes were seen as reflecting IBM's pricing actions last year that were geared to make purchase more attractive.

In to-be-installed 4300s, a marked shift away from IBM leases and rental agreements was seen. Whereas last year's survey respondents said they would spend 54% of their dollars on IBM two-year leases, only 23% said they would this year. In contrast to that downshift was an upswing in third-party leasing activity, rising to 27% of the total dollar volume in this year's survey from 11% last year. Purchase of 4300s will see a slight increase to 32% from last year's 25%. IBM Credit Corp. is expected by respondents to take in about 7% of the total dollars spent.

For Amdahl, the survey showed a tangible rise for 1983 of sales-to-lease ratio as the company's 580 machine begins volume shipments. A substantial number of 470s are being installed on lease, which could hurt the company if it is forced to make price concessions.

Asked if they had shifted their attitude towards purchasing systems, the majority of the 7% of IBM sites leaning towards lease said product cycles are changing too fast and that they were uncertain about the useful lives of machines. But IBM's lowering of purchase prices inclined 22% of the sites to say they favored purchase.

The 4300 remains the largest component of IBM's installed lease base, despite evidence that there has been substantial conversion to purchase during the last year. In terms of dollar value of leased/rented systems, the 4300 accounts for 44%, followed by the 3081 at 36%.

About one fifth of the leased 4300s are to be converted to purchase in 1983, respondents indicated. The same figure of 19% held for System/3 and 38 sites, while only 14% of 308X sites are expected to be switched this year.

Survey respondents indicated strong erosion in used computer prices for all classes of computers except the 3081, with the Amdahl V/6 model selling for as little as 7% of its original list price.

In the add-on IBM peripherals arena, a decided shift to sales, away from lease, was seen for all devices except tape drives. For instance, 71% of the sites procuring disk drives said they would rent or lease from IBM, compared to last year's figure of 78% and the year earlier's 82%. This is partially a reflection of moves IBM has made recently to encourage purchase of the 3380 drive.

Used computer prices are eroding as product cycles shorten and IBM's aggressive pricing policies take hold.

Overall, peripherals add-on activity was seen for the next 24 months as being about as strong as foreseen a year ago. About two fifths of the respondents expect to add disk, about 10% plan tape acquisitions, 10% plan add-on memory acquisitions, and two fifths will buy terminals.

Indeed, plug-compatible manufacturers had disk installed at only 23% of the responding sites, down from 25% last year; terminals to 32% of the sites, the same as last year; and, dramatically, add-on memory to only 22%, down from 42% two years ago. Pcm penetration into the System/38 base was found to be very low as indicated

FIG. 3

PERCENTAGE OF RESPONDENTS BUYING OFFICE AUTOMATION EQUIPMENT FROM THEIR MAINFRAME SUPPLIER

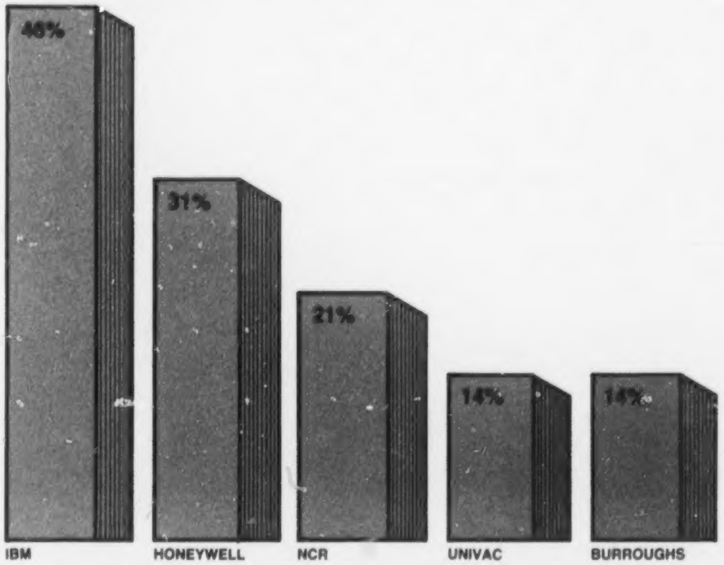
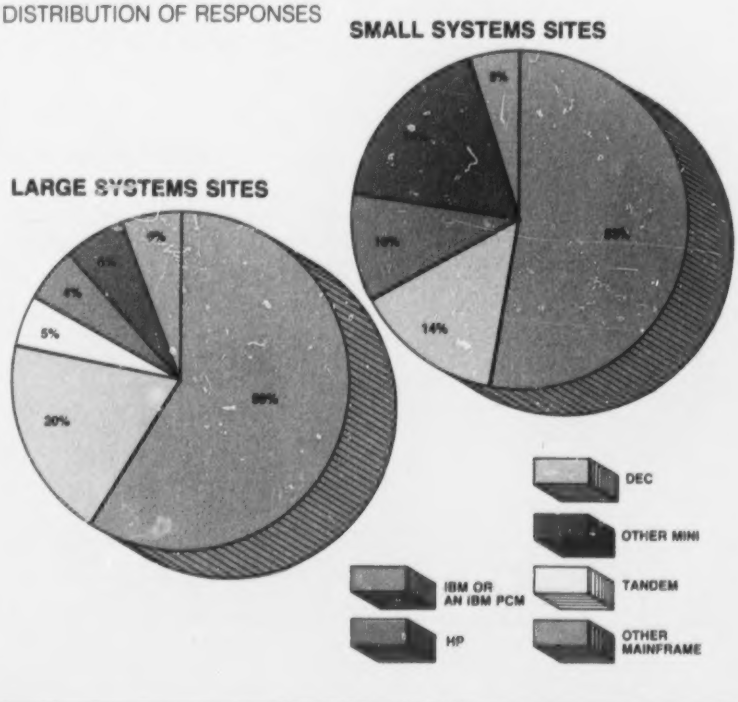


FIG. 4

POTENTIAL NEW VENDORS AT SITES CONSIDERING SWITCHING

DISTRIBUTION OF RESPONSES



in previous surveys.

Of course 1982 was the year IBM's 3380 disk came into the market in volume, capturing a large share of total disk sales to IBM respondents. Survey respondents indicated that, looking ahead 24 months, 53% of their disk units ordered would be 3380s, 21% would be 3370/5s, and the rest of 3350 or other vintage. By the end of 1984, it was shown, fully 47% of the total megabytes installed by respondents to machines they currently run would be in the form of 3380 disk drives.

In the midrange cpu-oriented 3370/5 disk market, IBM reversed a trend seen in last year's survey of pcms gaining ground. The industry leader had installed this year 93% of the total market, compared to last year's figure of only 83%.

In the add-on memory market, once populated by as many as a dozen vendors, only Amdahl (4%) and Control Data (2%) are left with any significant market share (2%). IBM controls 83% of the installed base.

In the terminal market, pcms have gained on IBM, but the company's late winter product introductions are expected to change that situation. This year's survey showed IBM with a 53% share of respondents' terminals, compared to last year's figure of 64% and a 1980 figure of 67%. Telex came in as runner-up, showing 5% share.

Plug-compatible peripherals makers have not had an especially good year, particularly in the disk arena.

For Burroughs, the survey this year brings some good news and some bad news. Its users indicated a strong shift of attitude towards their supplier, the second year such a shift has been seen following 1980, when a decidedly negative attitude was seen. More importantly for Burroughs, fewer users this year than last view the company and its products as inferior to IBM. This comes as the Detroit firm boosted its product line at the low end and attempted to correct many of the perceived faults of previous years.

Moreover, planned installation activity is up in this year's survey. Burroughs respondents said they would install equipment valued at about 41% of their currently installed gear, compared to last year's figure of 31%.

The company's 900 series products are apparently catching on quite well with users, so well that the company may have to find a follow-on product fast to maintain the order activity it is apparently enjoying. In other words, the B 4900 and B7900 product cycle could peak rather swiftly.

Add-on peripheral activity was seen as on par with last year's readings: about a fifth of users plan to install disk drives, about 30% plan to add terminals, and al-

FIG. 5

EXPANDING AMDAHL SHARE OF PCM SYSTEMS USER POPULATION

PERCENT OF ALL SITES WITH PCM CPU
ALREADY INSTALLED, ON ORDER, OR PLAN TO ORDER

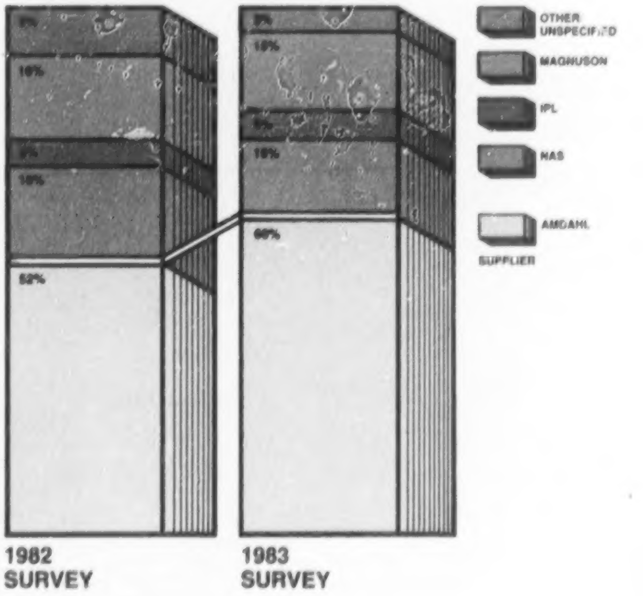
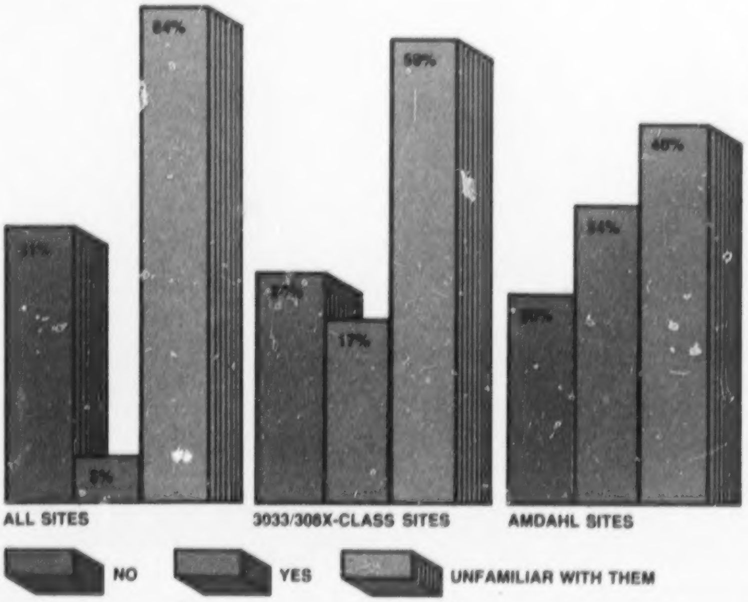


FIG. 6

EARLY INTEREST IN TRILOGY SYSTEMS AMONG AMDAHL USER SITES



most 15% plan to add memory.

In the small system area, Burroughs is finding apparent success with the workstations it buys from Convergent Technologies but is having dismal results from its Ofis 1 word processing/office automation systems. Presumably, however, Convergent's equipment is helping Burroughs extend beyond its own user base and develop new markets.

The year ahead for Honeywell will apparently be one of struggle to stem what appears to be a continuing trend of defection to other vendors, especially in the large-scale mainframe arena. The survey found little demand for the firm's top-of-the-line DPS 88, a winding down of the DPS 8 cycle, and projected order activity that is markedly subdued. In all likelihood, the company will suffer from lower net shipments in 1983.

The company's main strength is coming from the DPS 6/Level 6 small computer line, which is clearly a successful business. The minicomputers appear to be selling well not only to Honeywell's mainframe users for distributed processing purposes but also to other shops. The firm's office automation efforts are showing some signs of success within the mainframe base, but perhaps not enough yet to ensure a major avenue of future growth.

Honeywell's main strength is coming from the DPS 6/Level 6 minicomputer line, which sells well as an adjunct to the firm's mainframes.

One positive trend was a move by large-scale users to the new GCOS 8 operating system, which may portend upgrades of hardware next year.

NCR continues to have a lackluster outlook this year, showing potential strengths for the years beyond 1983 in some of its newest businesses, but not much in the way of growth in the mainframe arena. The company, it should be remembered, gains much of its revenue from overseas and from terminal systems activities.

NCR users, however, indicate an appetite for future capacity needs, suggesting a potentially strong reception for the recently introduced 9300 series and an expected 9500 line. Like Burroughs, NCR is finding success from the gear it purchases from Convergent Technologies and sells as the Worksaver line. Moreover, NCR has entered several new businesses lately—merchant semiconductors, personal computers, oem-oriented microcomputers, for instance—that are expected to grow rapidly in coming months.

Those new strategies will be vital to NCR in light of a continuing trend of defection by users from the firm's traditional mainframe base. In terms of comparing NCR to IBM, only half the share of users this year

FIG. 7

CHOICE OF STANDARD PC VENDOR

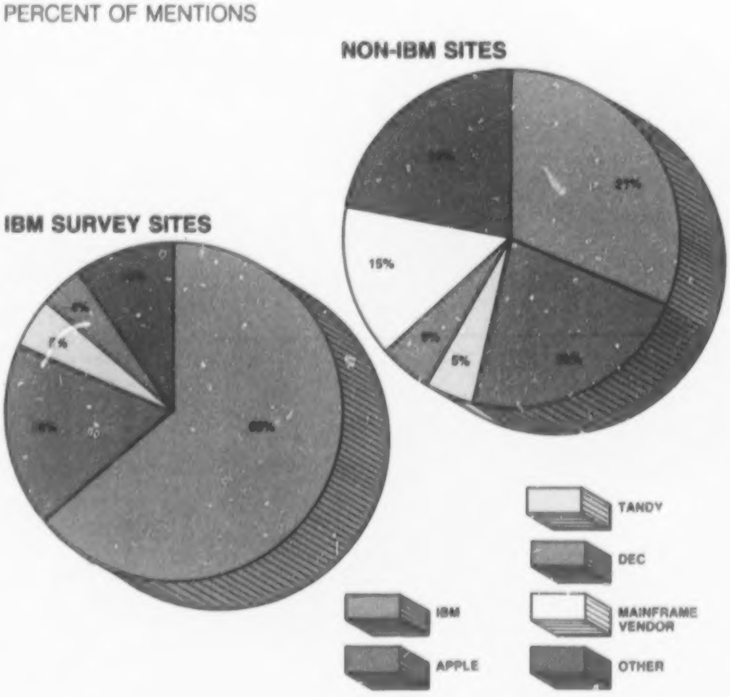
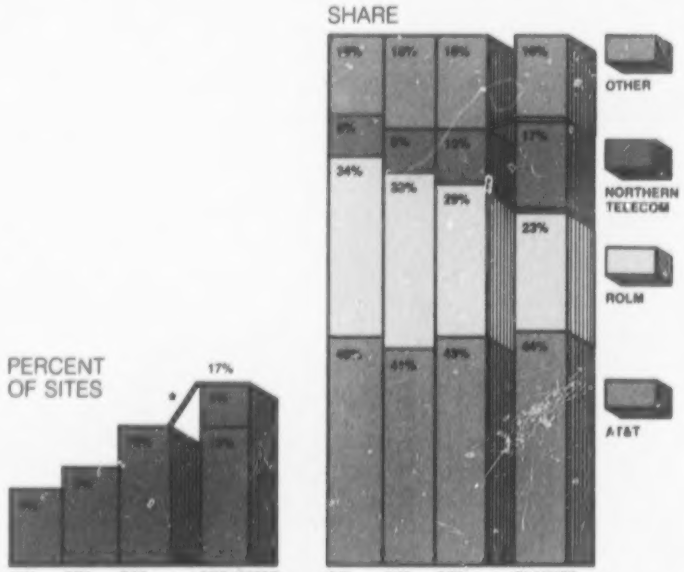
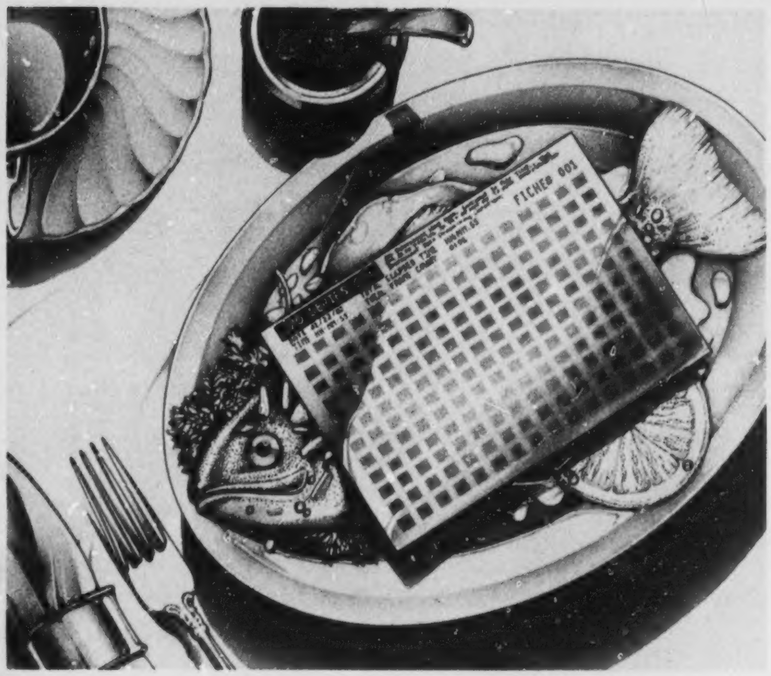


FIG. 8

PBX VENDOR MARKET SHARE





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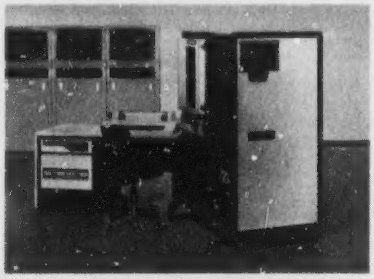

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CIRCLE 36 ON READER CARD

IN FOCUS

compared to two years ago rated NCR inferior to the industry leader.

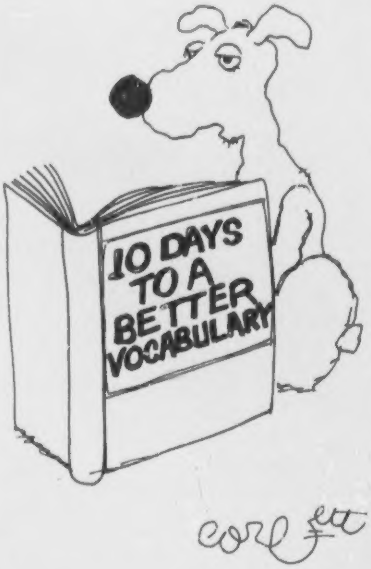
Sperry Univac's outlook for 1983 is relatively positive compared to the previous two years. The company's winning of large (over $400 million) government contracts for commercial and military machines will tide the firm over while its user base apparently waits for the 1100/90 systems to begin deliveries. Nevertheless, users indicated a disappointingly low requirement for additional processing capacity—in fact, the number of orders for the 1100/90 was surprisingly low (a total of only six among all respondents), considering the time since it was introduced.

On the bright side, Sperry has apparently found some success with its Sperrylink office automation system, particularly among users of its 1100/60 mainframes.

As has been the case for several years, there is a substantial dissatisfaction among users with the company and its fragmented product line (1100s and 90s). Few 90 users have taken to the firm's costly migration path to the 1100 series, suggesting the firm may suffer from defections to IBM and others. Among 90/30 users,, there was found to be an increasing number of sites tending towards replacing their Univac systems altogether.

—John W. Verity

The full results of this survey are available in a 275-page report for $750. Please call Sheila Connolly, (212) 605-9590.


10 DAYS TO A BETTER VOCABULARY

"Quack!"

CARTOON BY JACK CORBETT

The microfloppy race is on, and the results will make a difference in the office automation market.

WHICH MICROFLOPPY IS RIGHT?

by Peter Krass

The flexible disk has become an almost universal part of information processing. The 8-inch diskette serves as an interchange medium among many word processors and small business systems, largely because it has IBM's blessing. The 5¼-inch diskette is also popular in office systems, but has outdistanced the 8-inch type because it is used on personal computers as well as many office machines, where it is the basis of software publishing as well as a data medium. Now even smaller diskettes are coming to the fore, but the move toward standardization, a fact of life in larger diskettes, appears to be nowhere in sight. Clearly, companies planning new products that might use the smallest standard diskette want to move ahead. But which way they're likely to move depends on whom you ask.

"I've had the opportunity to talk to a pretty good sample of systems manufacturers during the last couple of months," says Jim Porter. "I can tell you what they intend to do, most of them: if they feel a need to go to a microfloppy in the next year or so, they are going to go with the 3½ inch. By this I mean the Sony design as changed by the Americans [whom Sony now agrees with]."

Jim Porter is the man behind *Disk/Trend Report*, the bible of the disk business. While he characterizes talking to people who use disks as his opportunity, a good number of people think a chance to talk to Porter is really their opportunity, because Porter has displayed an uncanny knack for sorting out the magnitude and direction of trends in the disk business. Porter's predictions about the Sony drive becoming a standard might be self-fulfilling.

Nevertheless, IBM has indicated it does not want to adopt the revised Sony standard, at least not yet. Instead, IBM is proposing a 3.9-inch device, and is trying to sell it to other manufacturers. Because IBM invented the floppy in the first place and because a lot of what IBM does becomes a standard, the IBM unit has to be taken seriously.

Also to be taken seriously are offerings from other vendors and coalitions of vendors, including the 3¼-inch unit pushed, notably, by Seagate and the 3-inch microfloppy favored by Hitachi and Matsushita.

Many oems will never worry about microfloppies. The small diskettes are not for every application. They clearly are important to makers of portable systems, where it's vital to save space. But portable computers are increasingly being used to capture data that will be used on fixed systems, and those fixed systems may well come from an oem or systems house, rather than from a company specializing in fitting a general purpose microcomputer into a briefcase.

In addition to portable systems, microfloppies have great potential in fixed equipment that uses a small footprint as a selling point. Hewlett-Packard, for instance, was the first American company to go with a microfloppy, selecting a Sony drive for small but not truly portable scientific computers. For many oems, it's as hard to ignore HP as to ignore IBM. They recognize that devices put in a computer today may well appear in electronic instruments tomorrow.

Lastly, in a market that is not yet important to many oems, but which may affect the fortunes of certain systems houses, the microfloppy may become a standard peripheral. This sector is office automation, where there is a real need for small storage devices in word processing equipment. For the big producers in this market, there are possibilities not only for business applications of a microfloppy, but also for huge sales to casual users, like students, who now buy portable typewriters, and other specialized users.

EMULATING 5¼-INCH MEDIA

The most important factor in any microfloppy, according to Jim Porter, is compatibility with 5¼-inch media. "That's the logical diskette volume to be emulated, not the 8-inch. Then system integrators can take advantage of the standard single-chip controller circuits, which are inexpensive. I believe Western Digital and NEC are selling their floppy controllers for as little as $8 to $10." But all of the microfloppies announced to date, with the exception of IBM's, adhere to standards established in the 5¼-inch market. They have 6,250 bytes per track and either 40 or 80 tracks per side.

IBM's microfloppy records a different amount of data on each track, and that requires a special type of controller that's not yet a standard. This doesn't mean that IBM can't create a standard, but a lot of vendors now designing products around microfloppies are counting on one or another unit that looks, to a controller, like a 5¼-inch drive. None, to date, have announced adoption of the IBM concept—and neither has IBM.

"The IBM unit is 2.6 inches high," Porter points out. "It can't be combined on a modular assembly basis with any other floppy or any of the hard disks. It's also running a 40 millisecond track-to-track access, and it must compete with drives as fast as 3 to 6 milliseconds track-to-track." It is clear, however, that IBM may well enhance its initial offering in order to sell it.

Omri Serlin, a Los Altos consultant, thinks it's too early for oems to write off IBM. He believes that "IBM has significant engineering talent and could rework its initial design into a very powerful product." But the industry could end up living with two microdiskette standards, just as it has gone with ASCII character codes while IBM has, except in some of its smallest products, stuck with EBCDIC.

Even Sony, the first company to get into the business, had to go from the 70-track unit it initially developed into an 80-track unit before it could sign up business in America.

For an oem that has to make a decision today, the Sony type of unit appears to be the safest bet. "Support for the 3½-inch type has been firming up," says Porter. "There are a whole lot of manufacturers who tell me they are planning to go that way."

As the 5¼-inch diskette established a form factor that led to standard sizes for companion Winchester disks, the 3½-inch diskette drive is leading several makers of small hard disks toward physically compatible micro-Winnies with capacities in the 5- to 10-megabyte range. This, too, will be considered by oems who plan to ride components

Three technologies to watch are magneto-optical, perpendicular recording, and isotropic recording.

FIG. 1

TOTAL WORLD SALES OF FLEXIBLE DISK DRIVES

(IN THOUSANDS OF UNITS)

YEAR	5¼-INCH	MICROFLOPPY
1981	2,205.2	5.0
1982	3,805.3	63.0
1983	5,209.8	211.1
1984	6,635.5	474.5
1985	7,724.7	952.2

Source: *Disk/Trend Report*, Mountain View, Calif.

FIG. 2

TOTAL VALUE OF WORLD MARKET IN FLEXIBLE DISK DRIVES

(IN MILLIONS OF DOLLARS)

YEAR	5¼-INCH	MICROFLOPPY
1981	498.8	2.4
1982	862.2	15.8
1983	1,239.1	14.5
1984	1,772.3	89.3
1985	2,288.1	156.4

Source: *Disk/Trend Report*, Mountain View, Calif.

down the price curves forged by competition and experience. Jim Porter suggests that "many manufacturers will want to stay in the mainstream" as microdiskettes and small Winchester disks gain acceptance.

If, as Porter suggests, oems adopt the Sony type of microfloppy, software publishing will quickly catch up to any new products that incorporate the small drive. Because the format is just like that of the 5½-inch floppy, diskette duplication equipment now in use can work with the new diskettes as soon as a new drive is attached.

The 5½-inch floppy is still on its way up, even as the 3¼-inch unit and its rivals are coming into the market. The only change in the diskette market that has really affected oems so far is the move to half-height 5½-inch floppy disk drives. Along with the 1.65-inch-high minifloppy has come a flattened Winchester disk, enabling oems to design increased storage capacity into existing cabinets. The market already offers multiple sources of these products, something that must be present before oems rush to embrace a microfloppy standard the way they have the minifloppy.

Nor will any perceived advantages of a microfloppy for new oem designs be adopted by companies that must install new equipment compatible with an existing base that is using a larger diskette format, at least not in systems that must interchange diskettes among old and new machines. The diskette type that is feeling the market shift is the 8-inch floppy, and it's only staying around, says Jim Porter, because of media interchange requirements. (In the floppy disk world, "staying around" means a growing market, as opposed to a booming one.)

The shift to microfloppies may result in greater systems reliability. The smaller dimensions of the microdiskette yield a reduction in certain mechanical problems inherent in diskette subsystems as the recording medium stretches and shrinks with changes in temperature and moisture.

FLOPPIES ARE MADE THE SAME

As for cost advantages, Porter thinks they're a way off. Volume production may keep the drive prices in the same range, but the media used with microfloppies is apt to be a bit more expensive than that used in 5¼-inch units. All floppy disks are made of pretty much the same components. The recording medium is a coating of ferrous material on a mylar substrate. After production, which involves preparation of the mylar so the magnetic material will properly bond to it, the diskette is burnished for smoothness and lubricated to reduce friction with the recording heads in a diskette drive. The diskette medium is placed in a jacket made of thermoplastic. Between the jacket and the diskette there is a liner of nonwoven material that picks up dirt from the surface of the diskette. Microdiskettes use a hard plastic jacket, while larger diskettes use a soft one. Also, the microdiskette package comes with a door that opens when a diskette is placed in a drive; larger diskettes are permanently exposed to the environment via windows cut in the jacket that are there to permit access to the medium by recording heads (and to allow holes in the diskette to signal rotational position to the drive).

"There's little difference in materials cost resulting from the smaller size of the microfloppy," says Porter. "But the hard jacket of a microfloppy will be slightly more costly than the minifloppy jacket for some time. I'd say that for a while microfloppy diskettes will cost about 20% more than minifloppy diskettes. Profits to the media makers will be about the same for both types."

One issue oems are considering is whether to ignore microfloppies for the moment and wait for further advances in technology. If an oem's customers will not benefit from smaller storage devices than the half-height 5¼-inch diskettes (and related Winchesters) provide, perhaps it will pay to be patient. But for oems with diverse interests and with a need to offer a range of current technologies, the huge volume of microfloppies likely to be sold in the next few years makes the device a serious candidate for inclusion in systems.

When Jim Porter looked into his crystal ball, he saw several promising technologies looming in the not-too-distant future. But these means of data storage may well coexist with floppy disks of various sizes, as there is no telling when their costs and storage capacities will be more attractive for many oem products than current offerings.

Three technologies to watch, he says, are magneto-optical, perpendicular recording, and isotropic recording. Magneto-optical recording uses the combination of a laser that can heat magnetic materials to their Curie point and magnetic fields to put data in very small areas. Because the technology allows data to be altered, it seems to be more promising than pure optical technology for computing applications. Perpendicular recording increases densities by orienting the residual magnetic fields up and down relative to the diskette (or hard disk) surface instead of in directions parallel to the plane of the surface. Isotropic recording is similar to present techniques, but with a high-resolution medium data can be stored at densities eight times the present practical maximum—about 50,000 bits per inch. All three techniques are working in laboratory models today, says Porter, but "none is going to make an impact on disk shipments until after 1985." ✽

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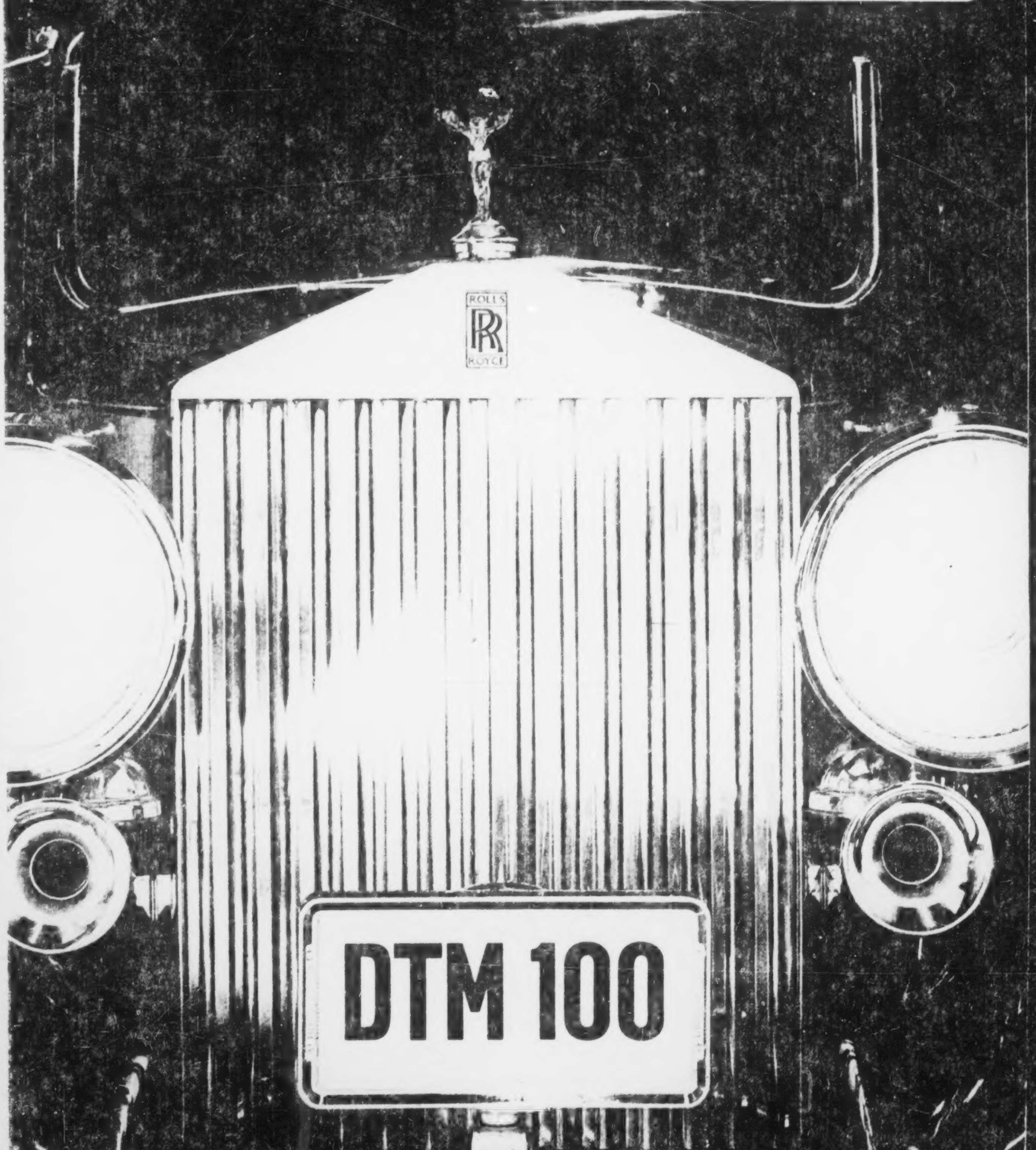
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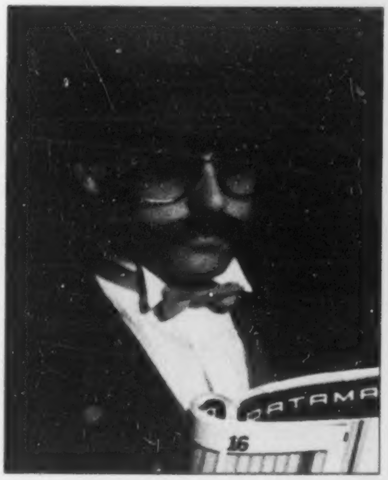

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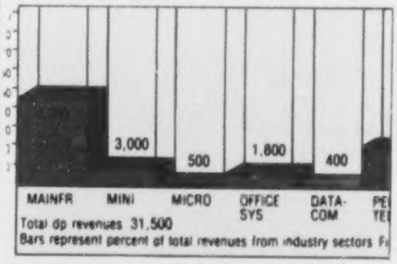

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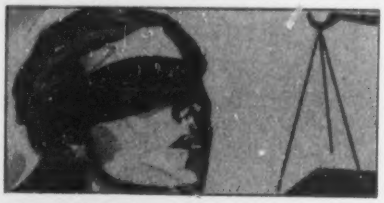

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COVER PHOTOGRAPH BY STEVE COOPER

Twelve new companies joined the upper crust of the information processing industry this year.

THE DATAMATION 100: WELCOME TO THE CLUB

by Pamela Archbold

The year 1982 will go down on the financial records as the worst yet for the information processing industry. To be sure, revenues of the DATAMATION 100 increased 17% over 1981 to reach $79.4 billion last year, but cumulative earnings of those companies plummeted. Of the industry's top 100 dp revenue producers, 40 reported

earnings declines for calendar 1982. Among those 40, seven reported huge losses. The once recession-proof industry found itself suffering in ways never imagined.

It appears as though many participants in the industry failed to recognize soon enough that the recession was going to have such a devastating effect on them, and they were unable to make the necessary shifts in time to salvage that all-important bottom line. No longer could a company introduce a product one day and have customers lining up at the door the next. During 1982 vendors saw their cost of sales soar as competition increased and customers got downright picky.

There were, of course, exceptions, and some companies exhibited the spectacular growth for which the dp industry has become known. The largest growth rates in 1982 came from companies that were seemingly overnight successes. They did, however, have a little help from friends in high places.

Convergent Technologies of Santa Clara, Calif., leaped into the DATAMATION 100 as number 89 with a growth rate of 636% over its 1981 report. This young company got a big shot in the arm from Burroughs's large oem contract for Convergent's multifunction workstations. These purchases accounted for 48% of Convergent's $96.5 million in 1982 dp sales.

The second overnight success was Huntsville, Ala.-based SCI Systems Inc., which had dp revenues in 1981 of a mere $15 million. Then IBM chose SCI to manufacture the guts of its Personal Computer, and SCI skyrocketed. Dp revenues during 1982 increased to $80 million, a 433% increase over the prior year, with IBM's business generating a good portion of those sales.

Sales are one thing, but earnings quite another. The list of last year's earnings losers is packed solid with Blue Chips of the industry—Burroughs down 21.1%, Amdahl down 74.7%, Control Data off 9.4%, Sperry down 36.8%, DEC down 14.4%, Data General off 75.1%, and M/A-Com down 27.2%. Even the big conglomerates, which have only a small portion of their business in information processing, had a hard time generating profits. Allied Corp., Boeing, Exxon, Harris, Lear Siegler, Martin Marietta, Raytheon, Signal Co., and TRW all reported lower earnings in 1982.

SEVEN SUFFERED SETBACKS

For seven of the DATAMATION 100 companies, an "earnings decline" is putting it mildly. They actually went into the red. Datapoint lost $17.4 million; National Semiconductor lost $15.4 million; Wyly racked up losses of $7.8 mil-

FIG. 1

THE GAINERS AND THE LAGGARDS

THE TOP 10 DP REVENUE WINNERS

COMPANY	% GROWTH	1982 DP REVENUES ($ MILLIONS)	1982 RANK
1. Convergent Tech.	636.6	95.6	89
2. SCI Systems	433.0	80.0	95
3. TeleVideo Systems	175.0	98.5	88
4. Tandon	151.0	177.1	54
5. Commodore	99.4	367.8	29
6. Intergraph	70.8	155.6	63
7. Apple Computer	65.5	664.0	19
8. Tandy	57.6	725.0	16
9. NBI	55.6	119.6	81
10. Micom Systems	49.1	78.0	97

THE TOP 10 DP REVENUE LOSERS

COMPANY	% DECLINE	1982 DP REVENUES ($ MILLIONS)	1982 RANK
1. General Automation	−27.2	84.1	93
2. Northern Telecom	−15.8	184.8	53
3. Lear Siegler	−13.3	130.0	76
4. Recognition Equip.	−12.1	110.0	83
5. Nixdorf Computer	−12.1	140.0	71
6. Signal	− 8.0	163.1	59
7. United Telecom.	− 6.0	150.0	65
8. Honeywell	− 5.0	1,684.7	8
9. Tektronix	− 2.8	300.0	38
10. Dun & Bradstreet	− 1.2	132.4	75

FIG. 2

CUTTING BACK AND STAFFING UP

EMPLOYMENT DECREASES

COMPANY	1982 EMPLOYMENT	1981 EMPLOYMENT	% CHANGE
1. Gerber Scientific	1,300	1,700	−23.5
2. Recognition Equip.	1,924	2,500	−23.0
3. General Automation	1,428	1,830	−21.9
4. Northern Telecom	3,300	4,001	−17.5
5. Dun & Bradstreet	1,614	1,872	−13.7
6. Sperry	78,027	89,541	−12.8
7. ITT	283,000	324,000	−12.6
8. Bradford National	3,000	3,400	−11.7
9. Signal	53,200	59,700	−10.8
10. Tymshare	3,600	3,975	− 9.4

EMPLOYMENT INCREASES

COMPANY	1982 EMPLOYMENT	1981 EMPLOYMENT	% CHANGE
1. Convergent Tech.	450	90	400.0
2. TeleVideo Systems	560	261	114.5
3. Tandon	2,500	1,400	78.5
4. NEC Info. Systems	400	250	60.0
5. Wang Labs	19,700	13,800	42.7
6. Intergraph	1,800	1,275	41.1
7. Micom Systems	915	652	40.3
8. SCI Systems	2,920	2,085	40.0
9. Apple Computer	3,400	2,500	36.0
10. Management Sci. Am.	1,348	1,002	34.5

FIG. 3

PERSONAL COMPUTERS COME OF AGE

COMPANY	1982 PC REVENUES ($ MILLIONS)	1981 PC REVENUES ($ MILLIONS)	% INCREASE
1. **Apple Computer**	664.0	401.1	65.5
2. **IBM**	500.0	N/A	N/A
3. **Tandy**	466.2	293.0	59.1
4. **Commodore**	367.8	184.4	99.4
5. **Hewlett-Packard**	235.2	195.0	20.6
6. **Texas Instruments**	233.0	144.3	61.4
7. **Digital Equipment**	200.0	N/A	N/A

AVERAGE GROWTH: 61.2%

FIG. 4

OFFICE SYSTEMS: THE DYNAMIC DOZEN

COMPANY	1982 OFFICE REVENUES ($ MILLIONS)	1981 OFFICE REVENUES ($ MILLIONS)	% CHANGE
1. **IBM**	1,800.0	1,600.0	12.5
2. **Wang Labs**	584.8	456.3	28.1
3. **Motorola**	274.9	232.0	18.4
4. **Lanier**	241.2	228.0	5.7
5. **Burroughs**	200.0	50.0	300.0
6. **Xerox**	200.0	132.0	51.5
7. **Philips Info. Sys.**	176.0	123.5	42.5
8. **Exxon**	165.0	165.0	N/A
9. **Northern Telecom**	133.8	162.2	− 17.5
10. **CPT**	126.9	102.8	23.4
11. **NBI**	119.6	76.7	55.9
12. **Digital Equipment**	100.0	N/A	N/A

AVERAGE GROWTH: 52.1%

FIG. 5

THE MAINFRAME MAKERS

COMPANY	1982 MAINFRAME REVENUES ($ MILLIONS)	1981 MAINFRAME REVENUES ($ MILLIONS)	% CHANGE
1. **IBM**	14,500.0	12,000.0	20.8
2. **Sperry**	1,765.0	1,880.0	− 6.1
3. **Burroughs**	1,300.0	1,255.0	3.5
4. **NCR**	900.0	900.0	N/A
5. **Control Data**	705.0	624.0	12.9
6. **Honeywell**	550.0	551.0	− 0.1
7. **Amdahl**	312.0	334.0	− 6.7
8. **National Semi.**	175.0	175.0	N/A
9. **Cray Research**	126.1	91.8	37.3

AVERAGE GROWTH 6.84%

lion; General Automation lost $5 million; Nashua was down $40.5 million; Recognition Equipment lost $9.6 million; and Centronics lost $32.3 million. (Recognition Equipment and Centronics had both shown losses in 1981.)

There were, of course, some notable exceptions to the trend toward plummeting profits. Here, too, Convergent Technologies leads the pack on the positive side, posting a whopping 1,387.5% profit increase to $11.9 million. Verbatim rebounded from a bad year in 1981, reporting a 945% earnings increase to $11.5 million last year. Bradford National also experienced a turnaround, with earnings up 125%. Planning Research saw profits climb 290%, and Tandon came in with a 206.4% jump. Commodore reported with pride its profits boost of 107.8%. But unfortunately for the industry as a whole, these earnings winners were the exception rather than the norm.

What happened? Many companies had ramped up production, their warehouses were bulging with new and exciting gear, and fattened sales forces were busting a gut to meet their quotas. But the economy just wouldn't cooperate. Customers were experiencing a severe budget crunch, and they either put off buying or opted for the lower-ticket items such as micros. By the time vendors realized sales were becoming hard to get and costly to come by, quarterly reports were already indicating pinched profits. At that point, the belt-tightening began in earnest. Heads rolled as companies started slashing the work force left and right.

For instance, Gerber Scientific, Recognition Equipment, and General Automation all made personnel cutbacks of over 20% during the year. (Ironically, National Semiconductor, which had made the news periodically throughout the year for big layoffs, actually had an expanded staff by year-end.) Along with personnel cuts came mandatory days off without pay, as well as an almost unheard of ploy in this industry—executives taking pay cuts. Sperry, for example, reduced compensation at the senior executive level by 17.5%.

In an incredibly short time, data processing went from the industry everyone wanted a piece of to the industry in which everyone was "repositioning." New names for old niches, new marketing strategies, realigned divisions, new management, the discarding of marginal operations—all these were tricks of the trade for selling into a changed economy, a changed market.

Especially apparent last year was the shedding of unprofitable operations. Many companies simply sold off or shut down their businesses that weren't apparent winners. Wyly is a good example: it found the hardware brokerage business so difficult that it took an $11.9 million loss just to get out of it. National Semiconductor, which was losing money all year, threw in the towel on the manufacture of mainframes, while Perkin-Elmer sold its money-losing memory products division. TRW had a falling out with its partner Fujitsu, reporting to DATAMATION that its dp-related revenues are now derived mainly from its software operations (which many consider credit reporting agencies). Bradford National, Recognition Equipment, and Comshare are examples of companies that had begun their repositioning back in 1981 and continued the trend toward streamlining operations in 1982.

Burroughs, number five in last year's listing, managed to creep past NCR and Control Data to become the third largest dp company.

Another effort at combating the recession was the notion of reorganizing what was already in place. IBM, DEC, Xerox, Honeywell, Perkin-Elmer, Burroughs, and Texas Instruments are a few of the many companies that reorganized their dp operations. A popular move was to shift marketing direction, a tack taken by both DEC and Data General.

Even more drastic measures were taken at some companies, as the boards of directors began getting annoyed with lackluster performance. A number of corporate presidents and chairmen were replaced. Bradford National, M/A-Com, Recognition Equipment, Tandem, Datapoint, and many others experienced top management shakeups during the year.

Despite all the cost-cutting schemes, the cloud still hovers over industry profits. For the first quarter of calendar 1983, Digital Equipment's earnings dropped 25.8% from calendar '82 first-quarter levels; Prime Computer's profits declined 19.8% from the comparable year-earlier quarter; and Storage Technology reported a staggering 93.8% earnings decline. Hopes for an economic recovery early in '83 were dashed; companies began pinning their hopes on a midyear turnaround.

As always, the DATAMATION 100 shows a number of companies shifting places during 1982. Near the top of the list, Burroughs, number five in last year's listing, managed to creep past NCR and Control Data to become the third largest dp revenue producer. Wang also had a good year, evidenced by its move up one notch to number nine, ahead of Xerox. Motorola, which had made two major dp acquisitions in 1981, saw the fruits of its labors last year as the company moved up from number 47 to number 23.

FIG. 6

MINICOMPUTERS: MIXED RESULTS

COMPANY	1982 MINI REVENUES ($ MILLIONS)	1981 MINI REVENUES ($ MILLIONS)	% CHANGE
1. **IBM**	3,000.0	3,000.0	N/A
2. **Digital Equipment**	1,680.0	2,068.1	−18.7
3. **Burroughs**	800.0	575.0	39.1
4. **Data General**	603.8	573.2	5.3
5. **Hewlett-Packard**	588.0	429.4	36.9
6. **Wang Labs**	584.7	456.4	28.1
7. **Prime Computer**	351.0	309.0	13.5
8. **Honeywell**	330.0	300.0	10.0
9. **Gould**	325.0	270.0	20.3
10. **Texas Instruments**	300.0	316.0	− 5.0
11. **Tandem Computers**	295.0	212.4	38.8
12. **Perkin-Elmer**	218.1	186.6	16.8
13. **Management Assist.**	201.5	222.5	− 9.4
14. **Datapoint**	160.0	160.0	N/A
15. **Mohawk Data Sci.**	149.0	137.0	8.7

AVERAGE GROWTH: 14.18%

MICROS IN THE MILLIONS

The most noticeable movement in ranks came from the makers of microcomputers. These ubiquitous little powerhouses were installed by the millions, as indicated by revenue growth of the pc makers. Tandy managed to move up to 16th place from its 21st slot a year earlier, as the company's dp revenues increased 57.6% to $725 million. Also coming on strong was Apple, which moved from number 23 to number 19 on its revenues increase of 65.5% to $664 million. The biggest jump of all, however, came from Commodore, which joined the big boys in the Top 50 by jumping from number 51 to number 29 on its 99.4% increase in sales to $367.8 million.

Last year also saw computer peripheral sales soar, as supplies such as tape and disk drives were gobbled up in large quantities. Among the DATAMATION 100, three companies stand out as top performers in this category. Dysan had a sales increase of 37% to $142.8 million; Verbatim's revenues rose 43.7% to $98.6 million; and Tandon, as already mentioned, saw revenues top $177 million for a 151% climb. Because this is such a booming business, it's worth noting that two other peripheral makers experienced great growth last year and came close to entering the DATAMATION 100 for the first time. Seagate Technology had a sales increase of 150.1% for a dp-revenues total of $57 million, and Cipher Data Products ended calendar '82 with sales of $70.1 million, up 111.1% over the year earlier total.

As is always the case, smaller companies on a fast track exhibit the greatest percentage increases in revenue growth. It's still interesting to note, however, that only four of the 10 fastest growing companies—Commodore, Apple, Intergraph, and Tandy—were even present on last year's DATAMATION 100 listing. On the other hand, companies that see sales slip from one year to the next are usually those year-after-year members of the Top 100 club. Last year General Automation, Northern Telecom, Lear Siegler, Recognition Equipment, and Nixdorf all reported revenue declines of more than 12%.

Last year saw a number of software and services companies lose rank, either because other participants in the total industry outshone their performance or because they themselves did poorly. Moving down the ladder were Tymshare, which dropped from number 33 to number 40; Wyly, which sank to number 70 from number 57; Dun & Bradstreet, which stepped down to number 75 from number 50; Martin Marietta, which dropped from number 71 to number 77; and Comshare, which moved to number 96 from number 84. Moving up one rung, however, was Automatic Data Processing, which stole the higher slot from Computer Sciences Corp.

12 NEW FIRMS ON TOP 100

Twelve new companies make their debuts on the DATAMATION 100 listing this year, with some of them posting such high growth rates as to make them eligible for the Top 10 fastest-growing companies club. Already mentioned were Convergent Technologies and SCI. Others include TeleVideo Systems, which ranks number 88 on the basis of its 175% increase in sales to $98.5 million, and Tandon, of floppy disk fame, which had an impressive growth year with revenues up 151.5% to $177.1 million. Other newcomers to the listing also had above-industry-average growth rates: Anacomp was up 50.9% to $82.4 million in sales; Micom was up 49.1% to $78 million; and Decision Data was up 48.3% to $74.3 million. With more detailed information this year than we were able to obtain last year, four additional companies are now on the listing. These include NBI, number 81, which had dp revenues of $119.6 million; Exxon Corp., whose office systems unit had an estimated $165 million in revenues, moving that company into number 58; Anaconda-Ericsson, which reports dp revenue of $208 million, giving it the rank of number 47; and BASF, number 65, which had dp revenues of an estimated $150 million. Another newcomer, Continental Telephone, joins the DATAMATION 100 by virtue of its acquisition of Cado.

With so many new faces in the DATAMATION 100, goodbyes had to be said to a number of others. The reasons for their exits were varied, but in all cases one hard fact remains: they didn't generate enough dp-related revenues to make the cutoff. Falling into this category are Computer Automation (number 86 last year), American Management Systems (number 91 the prior year), Cromemco (formerly number 95), Nashua (formerly number 90), MSI Data (number 98 last year), Triad Systems (formerly number 99), and General DataComm Industries (number 100 the previous year). Cado and Four-Phase also left the list because they were acquired by Continental Telephone and Motorola, respectively. Also off the list is Data Terminal Systems, which is being acquired by National Semiconductor, and Sun Co., which made a decision that its in-house dp department should no longer engage in outside work and thus last year sold its outside accounts.

Sadly, a few companies each year refuse to cooperate with us on the survey, and rather than guesstimating their calendar year results, we eliminate them altogether from the listing. This year Triumph Adler and its U.S. subisidiary, Pertec, is one such company we feel would have been a DATAMATION 100 contender. We also chose to exclude S.I.A.C., the NYSE and AMEX stock exchanges' processing division, because of its highly specialized nature.

The year 1982 was a challenging one for the dp industry. The difficulties of some companies turned out to be opportunities for others. The key was management's choice of using what they had to position their companies when recovery came. It was encouraging to know that a company could build a better mousetrap and then collect the rewards. In the future, the industry's challenge will be to be nimble, when times change fast.

FIG. 7

THE YEAR OF THE BULL

THE WALL STREET WINNERS

RANK	COMPANY	CLOSING PRICE JAN 1	CLOSING PRICE DEC 31	% CHANGE
1.	**IBM**	$56.875	$96.250	69.2
2.	**Digital Equipment**	86.000	99.500	15.6
3.	**Burroughs**	37.000	41.750	12.8
4.	**Control Data**	35.250	37.125	5.3
5.	**NCR**	43.375	86.000	98.2
6.	**Sperry**	35.375	33.375	−5.6
7.	**Hewlett-Packard**	39.625	73.000	84.2
8.	**Honeywell**	69.875	85.375	22.1
9.	**Wang Labs**	16.750	29.500	76.1
10.	**Xerox**	40.500	37.375	−7.7

THOSE WHO LOST THE MOST

COMPANY	CLOSING PRICE JAN 1	CLOSING PRICE DEC 31	% CHANGE
Telex	$ 6.500	$22.000	238.4
Decision Data	3.250	10.750	230.7
Verbatim	12.000	28.750	139.5
Bradford National	7.375	17.500	137.2
Tandon	14.250	31.500	121.0
Commodore	30.375	66.250	118.1
SCI Systems	14.250	29.750	108.7
NCR	43.375	86.000	98.2
Comdisco	17.500	34.500	97.1
Quotron Systems	17.875	33.750	88.8

HOW THE TOP 10 FARED

COMPANY	CLOSING PRICE JAN 1	CLOSING PRICE DEC 31	% CHANGE
Datapoint	$51.250	$18.375	−64.1
Storage Technology	35.000	21.250	−39.2
Tymshare	28.625	18.000	−37.1
Allied	43.875	32.375	−26.2
Data General	53.000	39.750	−25.0
Informatics	26.000	20.750	−20.1
Schlumberger	55.750	46.625	−16.3
General Automation	6.625	5.875	−11.3
Harris	41.125	37.000	−10.0
Tandem Computers	27.750	25.375	− 8.5

Methodology

Throughout the year, DATAMATION tracks over 175 companies on a worldwide basis. Our survey is meant to be used as a comparative analysis, and therefore all revenues and earnings figures have been adjusted to calendar year calculations. Because over half of the companies covered operate on a fiscal year that does not coincide with the calendar year, their revenues and earnings for purposes of this survey have been derived from quarterly reports. Numbers relating to R&D expenditures and total number of employees, however, are reported as of each company's fiscal year-end.

During 1982, a large number of Top 100 companies restated their performance figures, whether to reflect changed accounting methods, mergers, spinoffs, or just plain errors in earlier reports. While each chart and table within the survey incorporates the restated numbers, we do not alter the prior year's ranking for the companies concerned even though in some cases the restatements would have moved a company up or down a few notches.

Also, please note that a company's internal sales, or sales made to other divisions or units within the company, are excluded from the year's total dp revenues, as they are considered captive and not commercial sales.

For purposes of the survey, dp-related revenue is defined as general purpose dp products and services generated by one or more of the following categories of equipment: mainframes, minicomputers, microcomputers, office systems, data communications, peripherals and terminals, software and services, and maintenance and repair. Explicitly excluded are data transmission or "basic" services revenues from specialized common carriers; standalone electronic and mag card typewriters and standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment and dp supplies, with the exception of magnetic media for disk and tape drives. All peripherals that attach to a system are included. For computer-based manufacturing systems, such as computer-controlled machine tools, only the computer and hardcopy output devices are included and not the machine tool itself.

THE LEADING U.S. DP COMPANIES

THE DATAMATION 100

1982 RANK	1981 RANK	COMPANY	1982 TOTAL REVENUE	1982 DP REVENUE	1981 DP REVENUE	DP REV % GROWTH	DP REV AS % OF TOTAL
1	1	International Business Machines*	$34,364.0	$31,500.0	$26,340.0	19.5%	91.6%
2	2	Digital Equipment Corp.	4,018.8	4,018.8	3,586.6	12.0	100.0
3	5	Burroughs Corp.*	4,186.3	3,848.0	3,102.0	24.0	91.9
4	3	Control Data Corp.*	4,292.0	3,301.0	3,120.0	5.8	76.9
5	4	NCR Corp.	3,526.2	3,173.4	3,071.8	3.3	89.9
6	6	Sperry Corp.	5,242.7	2,800.5	2,781.0	0.7	53.4
7	7	Hewlett-Packard Co.*	4,335.0	2,164.8	1,837.5	17.8	49.9
8	8	Honeywell Inc.	5,490.4	1,684.7	1,773.7	−5.0	30.6
9	10	Wang Laboratories Inc.	1,321.5	1,321.5	1,008.5	31.0	100.0
10	9	Xerox Corp.	8,455.6	1,300.0	1,100.0	18.1	15.3
11	11	Storage Technology	1,079.2	1,079.2	922.0	17.0	100.0
12	15	Texas Instruments Inc.*	4,372.0	900.0	800.0	12.5	20.7
13	14	General Electric Co.	26,500.0	862.0	750.0	14.9	3.2
14	12	TRW Inc.*	5,131.9	825.0	620.0	33.0	16.0
15	13	Data General Corp.	803.8	803.8	764.4	5.1	100.0
16	21	Tandy Corp.	2,264.5	725.0	460.0	57.6	32.0
17	17	Automatic Data Processing	704.0	704.0	613.0	14.8	100.0
18	16	Computer Sciences Corp.	683.4	683.4	624.7	9.3	100.0
19	23	Apple Computer Inc.	664.0	664.0	401.1	65.5	100.0
20	18	ITT*	21,921.0	600.0	460.0	30.4	2.7
21	19	Electronic Data Systems	562.5	555.6	430.6	15.6	98.7
22	20	Datapoint Corp.*	506.4	506.4	506.2	N/A	100.0
23	47	Motorola Inc.	3,785.8	484.9	412.1	17.6	12.8
24	24	McDonnell Douglas Corp.*	7,331.3	476.4	347.2	37.2	6.4
25	27	Comdisco Inc.	464.8	464.8	343.9	35.1	100.0
26	22	Amdahl Corp.*	462.0	462.0	442.8	4.3	100.0
27	28	Rolm Corp.	447.7	447.7	331.5	35.0	100.0
28	25	Prime Computer Inc.	436.0	436.0	365.0	19.4	100.0
29	51	Commodore*	459.8	367.8	184.4	99.4	79.9
30	29	National Semiconductor	1,151.4	365.0	330.0	10.6	31.7
31	26	Management Assistance Inc.	354.2	354.2	349.1	1.4	100.0
32	30	Mohawk Data Sciences Corp.*	361.3	348.9	314.0	11.1	96.5
33	38	Tandem Computers Inc.*	335.2	335.2	238.7	40.4	100.0
34	31	Harris Corp.*	1,818.0	332.5	297.4	11.8	18.2
35	34	Computervision Corp.	325.2	325.2	270.7	20.1	100.0
36	36	Gould, Inc.	1,561.0	325.0	270.0	20.3	20.8
37	39	Racal Corp.	300.0	300.0	240.0	25.0	100.0
	32	Tektronix Inc.	1,200.6	300.0	308.9	−2.8	24.9
39	35	Dataproducts Corp.	297.6	297.6	270.0	10.2	100.0
40	33	Tymshare Inc.	297.0	297.0	289.7	2.5	100.0
41	45	C. Itoh Electronics, Inc.	326.4	290.6	213.0	36.4	89.0
42	37	Raytheon Corp.*	5,513.0	283.0	258.0	9.6	5.1
43	43	Lanier Business Products Inc.	365.4	241.2	228.0	5.7	66.0
44	44	3M	6,601.0	225.0	225.0		3.4
45	41	Perkin-Elmer Corp.*	1,010.9	218.1	186.6	16.8	21.5
46	49	Sanders Associates Inc.*	487.8	215.7	153.9	40.1	44.2
47		Anaconda-Ericsson Inc.	3,600.0	208.0	175.0	18.8	5.7
48	62	Paradyne Corp.*	207.3	207.3	139.0	49.1	100.0
49	60	Philips Information Systems	203.0	203.0	140.0	45.0	100.0
50	55	M/A-Com Inc.*	610.9	200.0	140.0	42.8	32.7

Ranking is by dp revenue in millions of dollars except where noted

*Restated figures

N/A = not available

1982 EMPL	1981 EMPL	DP REV PER EMP (DOLLARS)	R & D		EARNINGS PER SHARE	RETURN ON EQUITY	% DP REV FROM FOREIGN SOURCES	FISCAL YEAR END
			1982 ($MILLION)	% OF TOT REV				
364,796	354.936	86.3	2,053	5.9	7.39	23.4	45.0	Dec.
68,000	63,000	59.1	408	10.1	7.47	14.3	38.0	June
62,000	66,900	62.0	220	5.2	2.80	5.7	40.0	Dec.
56,000	60,600	58.9	326	7.5	4.11	11.1	32.0	Dec.
63,000	65,000	50.3	248	7.0	8.75	12.4	49.0	Dec.
78,027	89,541	35.8	409	7.8	3.40	9.2	40.0	Mar.
68,538	64,000	31.5	432	9.9	3.05	16.3	46.0	Oct.
94,100	96,923	17.9	397	7.2	12.16	13.2	27.0	Dec.
19,700	13,800	67.0	86	6.5	1.00	20.6	33.0	June
109,940	117,930	11.8	565	6.6	4.34	N/A	42.0	Dec.
N/A	15,197	N/A	N/A	N/A	1.88	N/A	N/A	Dec.
80,007	83,714	11.2	236	5.4	6.10	8.9	30.7	Dec.
367,000	404,000	2.3	1,600	6.0	8.00	18.8	40.0	Dec.
85,099	91,941	9.6	109	2.1	5.20	13.4	28.0	Dec.
14,945	14,465	53.7	84	10.5	1.16	5.8	35.0	Sep.
31,000	26,000	23.3	N/A	N/A	2.45	32.3	17.0	June
15,000	15,000	46.9	25	3.5	1.77	16.9	N/A	June
13,700	14,250	49.8	N/A	N/A	1.45	16.0	18.0	April
3,400	2,500	195.2	38	5.7	1.06	28.0	20.0	Sep.
283,000	324,000	2.1	1,080	4.9	4.75	11.5	10.8	Dec.
13,148	11,382	42.2	30	5.4	1.91	23.4	3.0	June
3,822	7,917	57.4	44	8.8	-0.87	0.5	20.0	July
78,800	80,800	6.1	278	7.3	4.64	11.3	33.0	Dec.
7,500	5,890	63.5	N/A	N/A	5.44	11.1	8.0	Dec.
N/A	300	N/A	N/A	N/A	N/A	38.7	17.0	Sep.
5,800	5,100	79.6	81	17.5	0.33	10.5	N/A	Dec.
6,020	4,823	74.3	29	6.4	1.85	21.2	6.0	July
5,000	4,636	87.2	37	8.4	1.48	31.1	43.0	Dec.
4,100	N/A	89.7	27	5.8	4.28	52.9	42.0	June
38,267	35,725	9.5	109	9.4	-0.68	-3.2	N/A	May
5,800	5,629	61.0	15	4.4	0.66	6.2	45.0	Sep.
6,000	5,200	58.1	20	5.6	0.96	9.9	35.0	April
3,600	2,730	93.1	33	10.0	0.76	11.9	31.0	Sep.
26,000	26,000	12.7	92	5.1	1.97	13.1	30.0	June
4,130	3,800	78.7	36	11.1	1.18	18.9	45.5	Dec.
25,175	24,770	12.9	121	7.7	2.10	10.6	12.0	Dec.
4,800	4,300	62.5	N/A	N/A	N/A	N/A	30.0	Mar.
22,924	23,541	13.0	117	9.7	3.78	13.4	39.0	May
4,300	4,700	69.2	20	6.8	1.22	4.2	20.0	Mar.
3,600	3,975	82.5	17	5.8	0.73	10.7	N/A	Dec.
800	600	363.2	N/A	N/A	N/A	N/A	N/A	Dec.
72,000	76,500	3.9	195	3.5	3.78	19.6	22.5	Dec.
5,025	4,036	48.0	8	2.2	1.68	24.1	4.0	May
87,388	91,419	2.5	349	5.2	5.37	20.1	N/A	Dec.
14,100	15,402	15.4	80	7.9	1.18	13.0	44.0	July
7,859	7,171	27.4	22	4.6	3.51	15.1	N/A	July
66,300	69,900	3.1	28	0.8	N/A	N/A	85.0	Dec.
3,072	2,726	67.4	15	7.5	1.24	18.5	N/A	Dec.
1,632	1,538	124.3	N/A	N/A	N/A	N/A	N/A	Dec.
8,739	7,844	22.8	23	3.7	0.79	14.0	N/A	Sep.

Ranking is by dp revenue in millions of dollars except where noted

*Restated figures

N/A = not available

THE LEADING U.S. DP COMPANIES

THE DATAMATION 100

1982 RANK	1981 RANK	COMPANY	1982 TOTAL REVENUE	1982 DP REVENUE	1981 DP REVENUE	DP REV % GROWTH	DP REV AS % OF TOTAL
51	58	Telex Corp.	$ 256.1	$ 194.7	$ 142.7	36.4%	76.0%
52	52	Teletype Corp.*	372.9	190.3	175.8	8.2	51.0
53	42	Northern Telecom*	2,468.9	184.8	219.5	−15.8	7.4
54		Tandon Corp.	177.1	177.1	70.4	151.5	100.0
55	46	Boeing Co.*	9,035.0	171.0	144.0	18.7	1.8
56	56	Informatics General Inc.	170.0	170.0	150.3	13.1	100.0
57	63	Shared Medical Systems	165.7	165.7	131.6	25.9	100.0
58		Exxon Corp.	103,600.0	165.0	165.0	N/A	0.1
59	48	Signal Cos.	4,935.6	163.1	177.3	−8.0	3.3
60	53	General Instrument Corp.*	1,002.0	163.0	160.0	1.8	16.2
61	77	NEC Information Systems Inc.	6,000.0	160.0	100.0	60.0	2.6
62	66	CPT Corp.	158.5	158.5	123.8	28.0	100.0
63	80	Intergraph Corp.	155.6	155.6	91.1	70.8	100.0
64	61	United Telecommunications Inc.*	2,419.2	150.8	160.5	−6.0	6.2
65		BASF Systems Corp.	16,000.0	150.0	100.0	50.0	0.9
	81	Diebold Inc.	427.6	150.0	90.0	66.6	35.0
67	50	Allied Corp.*	6,167.0	147.1	128.7	14.2	2.3
68	73	Dysan Corp.	142.8	142.8	104.2	37.0	100.0
69	75	Cray Research Inc.	141.1	141.1	101.7	38.7	100.0
70	57	Wyly Corp.*	140.5	140.5	118.8	18.2	100.0
71	54	Nixdorf Computer Corp.	140.0	140.0	159.3	−12.1	100.0
72		Continental Telephone Inc.	1,817.7	139.3	118.2	17.8	7.6
73	67	Centronics Data Computer Corp.	138.4	138.4	118.9	16.4	100.0
	72	Planning Research	320.7	138.4	106.6	29.8	43.1
75	59	Dun & Bradstreet*	1,461.6	132.4	134.1	−1.2	9.0
76	94	Lear Siegler Inc.	1,459.8	130.0	150.0	−13.3	8.9
77	71	Martin Marietta Corp.	3,526.5	122.0	112.2	11.4	3.5
78	82	Quotron Systems Inc.	120.9	120.9	88.1	37.2	100.0
79	70	Reynolds & Reynolds	224.2	120.5	115.2	4.6	53.7
80	78	National Data Corp.*	120.3	120.3	111.0	8.3	100.0
81		NBI Inc.	119.6	119.6	76.7	55.9	100.0
82	64	Bradford National	134.6	115.4	102.0	13.1	85.7
83	65	Recognition Equipment Inc.*	110.9	110.9	126.1	−12.1	100.0
84	74	Gerber Scientific Inc.	115.8	107.2	101.9	5.2	92.5
85	79	Commerce Clearing House Inc.	350.1	104.5	91.9	13.7	29.8
86	85	Management Science America Inc.	101.2	101.2	73.1	38.4	100.0
87	87	Verbatim Corp.	98.6	98.6	68.6	43.7	100.0
88		TeleVideo Systems Inc.	98.5	98.5	35.8	175.1	100.0
89		Convergent Technologies	96.5	96.5	13.1	636.6	100.0
90	83	Modular Computer Systems Inc.	92.8	92.8	87.2	6.4	100.0
91	97	Floating Point Systems	89.0	89.0	64.0	39.0	100.0
92	76	Mannesmann-Tally	125.5	87.5	78.0	12.1	69.7
93	69	General Automation Inc.	84.1	84.1	115.6	−27.2	100.0
94		Anacomp Inc.	150.8	82.4	54.6	50.9	54.6
95		SCI Systems Inc.	133.0	80.0	15.0	433.3	60.1
96	84	Comshare Inc.	78.6	78.6	82.2	−4.3	100.0
97		Micom Systems, Inc.	78.0	78.0	52.3	49.1	100.0
98	93	Printronix Inc.	77.4	77.4	60.1	28.7	100.0
99	89	Schlumberger	6,283.8	76.2	64.0	19.0	1.2
100		Decision Data	74.3	74.3	50.1	48.3	100.0

Ranking is by dp revenue in millions of dollars except where noted.

*Restated figures

N/A = not available

1982 EMPL	1981 EMPL	DP REV PER EMP (DOLLARS)	R & D		EARNINGS PER SHARE	RETURN ON EQUITY	% DP REV FROM FOREIGN SOURCES	FISCAL YEAR END
			1982 ($MILLION)	% OF TOT REV				
3,933	3,806	49.5	10	4.0	1.80	19.3	16.0	Mar.
4,616	4,974	41.2	32	8.6	17.56	N/A	N/A	Dec.
3,300	4,001	56.0	241	9.7	3.31	15.2	N/A	Dec.
2,500	1,400	70.8	7	4.2	0.86	23.7	10.0	Sep.
95,700	101,000	1.7	N/A	N/A	3.02	19.0	2.8	Dec.
2,600	2,470	65.3	5	3.4	1.49	22.4	12.0	Dec.
1,825	1,500	90.7	13	8.2	0.88	14.0	N/A	Dec.
173,000	180,000	0.9	707	0.6	4.82	14.9	N/A	Dec.
53,200	59,700	3.0	210	4.2	1.56	6.7	N/A	Dec.
22,000	22,000	7.4	25	2.4	3.27	19.4	N/A	Feb.
400	250	400.0	N/A	N/A	N/A	N/A	N/A	Mar.
1,458	1,274	108.7	8	5.2	0.99	22.3	33.7	June
1,800	1,275	86.4	19	12.6	1.12	12.7	33.0	Dec.
29,309	29,680	5.1	11	0.4	2.49	N/A	1.0	Dec.
1,200	1,000	125.0	N/A	N/A	N/A	N/A	N/A	Dec.
6,051	6,416	24.7	6	1.4	4.80	22.5	N/A	Dec.
44,337	58,224	3.3	186	3.0	6.22	10.4	N/A	Dec.
2,900	2,300	49.2	25	17.8	0.55	6.8	15.0	Oct.
1,352	1,079	114.0	28	20.0	1.38	18.2	N/A	Dec.
1,850	1,700	75.9	5	3.5	−0.56	6.9	N/A	Dec.
1,700	1,700	82.3	N/A	N/A	N/A	N/A	N/A	Dec.
21,698	21,502	6.4	N/A	N/A	2.32	39.0	N/A	Dec.
2,000	1,900	69.2	N/A	N/A	N/A	N/A	25.0	Jan.
6,200	6,600	22.3	0	0.2	1.13	13.7	18.3	June
1,614	1,872	82.0	6	0.4	5.06	29.5	4.5	Dec.
21,983	23,985	5.9	28	1.9	3.55	17.0	16.0	June
40,900	41,200	3.0	82	2.3	2.92	17.6	19.6	Dec.
1,164	N/A	103.8	7	6.0	1.05	12.5	N/A	Dec.
3,349	3,329	35.9	5	2.4	1.69	9.6	N/A	Sep.
2,458	2,600	48.9	2	1.6	0.95	21.1	2.0	May
1,667	1,349	71.7	6	5.1	1.34	20.4	N/A	June
3,000	3,400	38.4	1	1.4	0.22	3.2	1.0	Dec.
1,924	2,500	57.6	7	6.7	−1.44	N/A	30.0	Oct.
1,300	1,700	82.4	8	7.5	0.55	7.7	N/A	April
5,300	5,109	19.7	N/A	N/A	3.50	55.3	N/A	Dec.
1,348	1,002	75.0	21	21.5	0.62	10.7	23.0	Dec.
1,790	1,487	55.0	6	6.7	1.10	37.6	31.0	July
560	261	175.8	2	2.8	0.36	6.6	24.0	Oct.
450	90	214.4	7	7.4	0.42	N/A	N/A	Dec.
N/A	1,481	N/A	N/A	N/A	0.34	1.8	N/A	Dec.
1,390	1,050	64.0	9	11.0	1.28	18.9	24.0	Oct.
1,600	1,500	54.6	12	9.5	N/A	N/A	75.0	Dec.
1,428	1,830	58.8	4	5.3	−1.90	N/A	39.6	July
2,500	2,000	32.9	N/A	N/A	0.61	9.0	10.0	June
2,920	2,085	27.3	N/A	N/A	1.13	12.2	N/A	June
1,280	1,400	61.4	7	8.9	0.18	−1.8	33.0	June
915	652	85.2	5	7.0	1.70	26.6	23.0	Mar.
1,097	1,071	70.5	2	2.9	1.50	16.7	19.0	Mar.
N/A	N/A	N/A	N/A	N/A	4.60	28.0	N/A	April
1,000	950	74.3	3	4.1	0.57	8.1	N/A	Nov.

Ranking is by dp revenue in millions of dollars except where noted.

*Restated figures

N/A = not available

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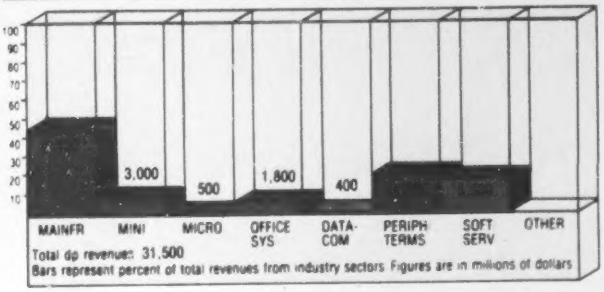

INTERNATIONAL BUSINESS MACHINES CORP.

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(914) 765-1900

Once again International Business Machines Corp. proved the business school theory that the number one company in an industry will outperform its peers in bad times as well as good: 1982 may have been a recessionary time for most of the mainframe companies, but IBM's revenues and earnings rebounded to record levels after weakness in 1981. A long list of triumphs made Big Blue a stock market favorite—the price almost doubled to 96 by year-end.

DATAMATION estimates total data processing revenues of $31.5 billion were up 20% from 1981. Earnings rose 22% to $4.4 billion, after a $449 million increase due to a change in foreign currency translation. Significant changes in the revenue flow were part of IBM's more aggressive attitude toward its markets: outright sale of computers and peripherals accounted for 49% of total revenues in 1982 versus 42% in 1978, while the percentage of revenues representing rentals dropped to 32% from 46%. Analysts explain that the new IBM pricing strategies, such as its volume discount program, and new credit policies made purchase more attractive for customers.

IBM's personal computer, a resounding success with more than 200,000 shipped in 1982, was only one of the many successful hardware products in a weak economy. Mainframe models continued to sell well, with revenues up 21% to $14.5 billion, according to DATAMATION estimates. The top-of-the-line 3081 model was a big hit, as was the delayed 3380 disk storage system. Office automation equipment such as Displaywriter and Datamaster workstations were up 13% to $1.8 billion.

Only the older midrange systems, the company said, suffered soft order rates in the second half of 1982; DATAMATION estimates minicomputer revenues were flat at $3 billion.

The end-user emphasis is typical of the strong impact on the company of John Opel, president and chief executive. He spearheaded the 1981 reorganization of the sales, support, and marketing operations, a huge success according to analysts and IBM watchers. New joint venture arrangements, unheard of in the past, became commonplace in Opel's first year as ceo—strong links were made with chip supplier Intel, telephone switching equipment maker Mitel, and small computer supplier Matsushita. New market efforts are also part of the new, more dynamic IBM such as its venture in robotics.

On the horizon are several challenges that may slow the strong momentum Opel & Co. have built up over the past year. The midrange machines, the 4300 series, are four years old and in need of replacement. Japanese firms like Fujitsu are mounting ever-stronger efforts in large computers. To meet the competition, the Sierra machine, rumored to have capabilities of up to 50 million floating point operations/sec., is expected soon.

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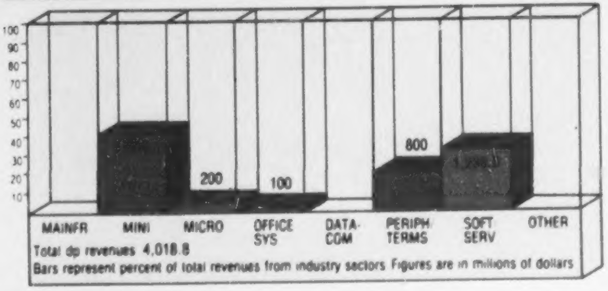

DIGITAL EQUIPMENT CORP.

146 Main Street
Maynard, MA 01754
(617) 897-5111

The recession finally caught up with Digital Equipment Corp. After years of strong annual sales and earnings gains despite the weak economy, including a 30% jump in 1981, DEC took it on the chin last year. To be sure, total dp revenues were up 12% to more than $4 billion, but slow hardware sales in general, and for DEC's primary product, 16-bit minicomputers, in particular, crumpled the long string of annual earnings records.

Minicomputer revenues were down 19% to $1.7 billion, with the popular VAX line of 32-bit superminicomputers the only bright spot in the cpu area. Slack demand from oems for DEC's bread-and-butter line, the PDP-11, was especially painful. The May introduction of the new DEC personal computer trio helped, adding $200 million in overall dp revenues, DATAMATION estimates. The recently introduced office automation systems also had a positive impact, adding another $100 million to sales. The big increases in revenues came, of course, from peripherals and software: each was up about 33% to $800 million and $1.2 billion, respectively.

The recession's impact was strongest in the profits column—DEC's calendar year net income dropped 14% to $347 million in 1982, despite the cost-control efforts made by president and chief executive Kenneth Olsen. Hiring limitations early in the year soon gave way to a payroll freeze. Internal controls were not enough to ease the burden of foreign currency translations, as the strong dollar abroad forced DEC to cut its gross margin dramatically—overseas profits dropped 26% in the 1982 fiscal year, to $215 million.

Despite the earnings pressure, Olsen kept intact an ambitious research and development program—last year R&D spending leaped 63% to $409 million. In addition to the personal computer group, DEC introduced several new microcomputer chips as well as a sophisticated disk storage system. Emphasis on new user application programs for office automation and other lucrative end-user commercial areas continued as the company expanded its position from hardware manufacturer to systems supplier. R&D spending is expected to plateau at 9% of revenue, a slight decrease from the 1983 mark but significantly above the rate of the past several years.

At year-end Olsen pointed to rising order rates as a sign of recovery for the company. Strong demand for the office automation system, personal computers, and the new low-end superminicomputer indicated that DEC would rebound in 1983 but that it would not reach the record earnings level until next year.

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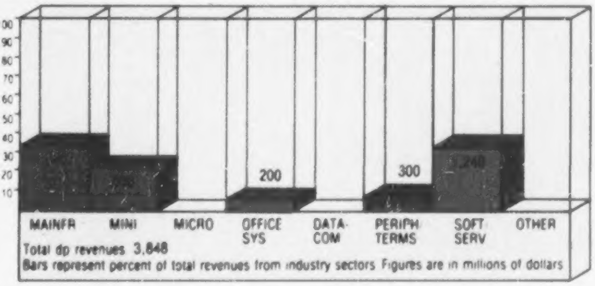

BURROUGHS CORPORATION

Burroughs Place
Detroit, MI 48232
(313) 972-7000

Burroughs Corp. spent last year cleaning shop as it gathered its forces for a renewed marketing assault under the leadership of chairman W. Michael Blumenthal. The company introduced a number of major new products, revamped top management, and increased its pursuit of the IBM customer world.

Total data processing revenues for 1982 are estimated to be $3.85 billion, out of a total of $4.19 billion in revenues. While net earnings for the year did not meet analysts' expectations, they came in at a fairly healthy $165.9 million. That was up slightly from the previous year's net of $148.9 million on revenues of $3.41 billion.

Much of the firm's profit-making came from the Memorex subsidiary, which was purchased in late 1981 for $115 million. Memorex brought with it a large debt but also gave Burroughs a firm foothold in the IBM-compatible market. That is an arena Burroughs would very much like to pursue as it concedes IBM's dominance and ability to set de facto standards.

The company's renewed efforts, including a planned R&D budget of $260 million this year, were hampered by adverse order rates and the strong dollar's effect on foreign exchange. Blumenthal, however, has said he expects a turnaround in orders to become apparent in the second half of 1983.

But, in the meantime, Burroughs realigned its top management, reaching outside its own ranks to IBM, Nixdorf, Bendix, and Xerox for new ideas and approaches to the fast-changing data processing market. Prime among the appointments was Paul G. Stern, the new president, whom Blumenthal had hired a year earlier as chief of engineering and manufacturing. Stern, formerly of Gillette Co. and Rockwell International, is hoped to bring to Burroughs a strong hand in planning the company's advances into the marketplace. Blumenthal's strength, he admits, is in finance while the 43-year-old Stern is a physicist by training.

Among the new products Burroughs brought to market are the B 20 workstation/microcomputer, built by Convergent Technologies; a series of B 4900 and B 7900 mainframe processors designed as upgrades for previous products; the CP 9580 communications processor, which attaches into IBM's SNA circuits; and, from Memorex, the 3680 line of high-capacity drives.

Other trouble spots for Burroughs include its Ofis 1 office automation equipment which, according to the Cowen & Co./DATAMATION survey of mainframe users, has produced dismal results; and a series of pending user lawsuits relating the B 800 line of computers. The B 20 is said to have been well received by Burroughs mainframe users, but it is not clear that the company can move the machine successfully into new arenas.

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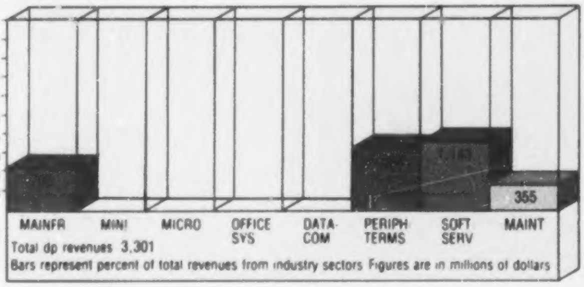

CONTROL DATA CORPORATION

8100 34th Avenue South
Bloomington, MN 55440
(612) 853-8100

After six years of steady growth, Control Data found 1982 tough going. While it managed a 5.8% increase in dp revenues and a 4.6% increase in corporate revenues for the year, corporate profits fell 9.4% to $155 million from $171 million. The decline is largely attributable to CDC's Commercial Credit financial subsidiary, which was hard hit by the recession.

Several years ago, CDC was the first of the BUNCH to decide that competing directly with IBM was not a desirable strategy; consequently, it chose to diversify into peripherals and services as a way to ensure its success. This path had worked very well, giving CDC a 60% share of the mainframe peripherals market and turning it into the nation's largest service company.

The primary culprit of CDC's lower earnings was its oem disk drive business, which soured in 1982. The disk drives CDC supplied to other vendors contributed about 90% of its $1.12 billion in peripheral sales in 1981, and as 1982 began CDC was fully geared up for volume production of new product lines. Unfortunately, nobody wanted to buy and inventories mounted. The company reacted quickly with plant shutdowns and layoffs, but sales remained depressed all year. Final sales of the peripherals division dropped 1.8% to $1.098 billion for the year.

On the services side, the picture was brighter, but 1982 could still be called an off year. Revenues climbed 10.9% to $930 million, a slower pace than CDC had experienced in the previous five years, when revenues doubled. Still, the service operation is by far the largest in the country. While CDC has numerous scientific and governmental contracts, the bulk of its business comes from commercial clients like the Ticketron entertainment reservation and ticket sales network.

Another ray of hope for Control Data is the educational market, where the company has spent some $900 million in R&D over the past 20 years. One product from this effort, the Plato computer assisted educational system, finally appears to be paying for itself. Once seen as Control Data's answer to the Edsel, Plato has seen some success among corporations as a training tool: General Motors uses Plato to train its workers in assembling robots. Control Data has been looking for a larger market for Plato, and in 1982 made some of the Plato programs available to PC owners of Apple, Atari, and Texas Instruments.

Control Data is still the number two supercomputer maker as well. Despite a slack market and fierce competition from crosstown rival Cray Research, CDC's mainframe revenues increased 13% in 1982, to $705 million. But Control Data still has less than 30% of the supercomputer market; instead, much of the credit for the improved mainframe revenues goes to the 800 series of general purpose mainframes.

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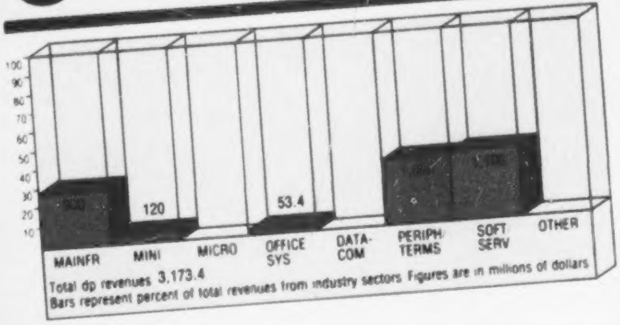

Total dp revenues 3,173.4
Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

NCR CORP.

1700 South Patterson Boulevard
Dayton, OH 45479
(513) 445-5000

Like many of its mainframe competitors, NCR found only modest growth in revenues and profits last year, but it boldly entered several high-growth markets in which it has never competed before. Revenues were up only 3% to $3.5 billion, while profits rose 13% to $234.4 million, compared to the previous year.

The slow growth was attributed to the worldwide recession's effect on orders and to adverse foreign exchange rates. The company said, however, that it expects a slow recovery to begin in the second half of this year. It also claimed to have emerged from 1982 in a "healthy financial position."

The biggest development at the company last year was its embarkation on an ambitious plan to broaden its product line downward, taking advantage of new technologies and leveraging internally developed products into new markets. The new push was backed by an 8% boost in R&D spending, to $248 million. The company also began operations in a newly built microelectronics facility.

In the merchant semiconductor market, NCR continued to offer nonvolatile memories and marketed for the first time a set of 32-bit microprocessor chips. The NCR/32 microprocessor chip set showed up in early 1983 as the basis of the new 9300 mainframe line.

NCR last year also made its debut in the oem arena, offering a multi-user Unix system based on Motorola's 68000 microprocessor. Designed for sale in volume to systems houses and distributors, the so-called Tower 1632 system is expected to form the basis of a fully packaged system NCR will sell to various vertical markets this year.

Early 1983 saw NCR enter the personal computer market with Decision Mate V, a locally networked system aimed at office use. It runs on the MS-DOS and CP/M operating systems and can be attached to an NCR-designed file server.

The Applied Digital Data Systems subsidiary continued to expand its lines of crt terminals and Multivision small business computers. The latter use the popular Pick operating system and have found substantial success in a market once dominated by Microdata. ADDS founder and chairman William Catacosinos left in early 1983 but continued to consult with NCR.

In the office systems market, a relatively new one for NCR, the company introduced its first internally developed word processor, the First Step. It also continued to sell, apparently without great success, Convergent Technologies' workstation under the WorkSaver label.

NCR's two strongest vertical markets, financial and retailing systems, saw several important new products. These include the POS terminal, a mini-based system for small stores.

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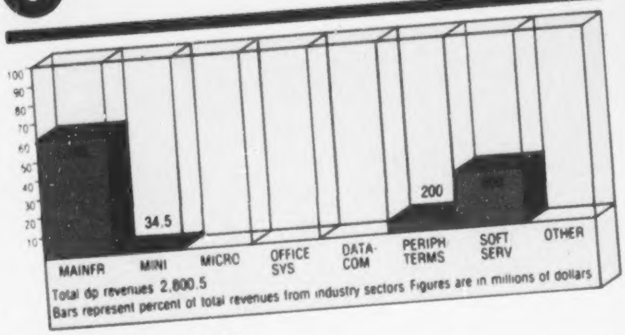

Total dp revenues 2,800.5
Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

SPERRY CORP.

1290 Avenue of the Americas
New York, NY 10104
(212) 484-4278

Weak demand for Sperry's mainframe computers plagued the company for most of calendar 1982, as new orders fell 4% and data processing revenues were flat at about $2.8 billion. Computer division earnings, reported only on a fiscal basis, with FY '82 ending March 31, plummeted to about $100 million, or a third less than the anemic $150 million of 1981. The recession's impact on Sperry's key computer markets, manufacturing and energy companies, was especially painful as the conglomerate's aviation, farm implement, and hydraulic equipment lines were simultaneously hard hit by the economy. By year-end, though, several important new products filled gaps in the computer line and order rates improved.

The long-awaited introduction of top-of-the-line cpu, the 1100/90, was met last summer with the open checkbooks of customers squeezed into the limit of their 1100/80 series systems. Within months of its July introduction, American Telephone & Telegraph, for example, ordered $58 million worth of the new model for inventory tracking and other projects. The 90 models, with a maximum performance of 25 million instructions per second, is three to four times faster than the 1100/80 series and customer interest "exceeded expectations," says Joseph Kroger, computer systems president.

After several false starts in the office automation market, Sperry's latest entry, Sperrylink, was unveiled in October. The executive workstation features word and data processing, personal computing, CP/M compatibility, and other features. Company officials hope that Sperrylink revenues will approach $1 billion by 1985 and soar to 50% of the computer group's total revenues by the end of the decade; analysts caution that while Sperrylink will be attractive to existing Sperry customers, its chances in the hotly competitive open market are less than optimum owing to its reliance on a mainframe and a lack of exclusive features.

Research and development spending jumped 20% to about $300 million, or more than 10% of sales last year, as the company focused on software along with the technological advances expected from the world's oldest computer company. In another break with the past designed to emphasize the systems approach, the dp business is no longer called Univac, but Sperry Computer Systems.

As for 1983, the company's dp revenues and earnings are expected to modestly improve due to increased Defense Department orders and new financial controls. As part of a belt-tightening process, Sperry decided to halt offering subsidized financing for computers, laid off 11,000 employees companywide, and cut executive salaries by 17.5%.

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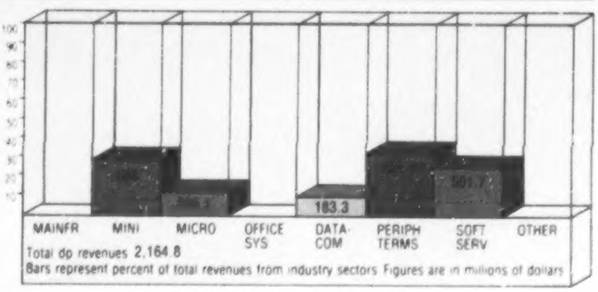

Total dp revenues 2,164.8

Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

HONEYWELL INC.

Honeywell Plaza
P.O. Box 524
Minneapolis, MN 55440
(612) 870-5200

For Honeywell, 1982 presented an almost overwhelming array of problems, obstacles, and misfortunes to overcome, and to some extent the company was successful. Overall, Honeywell posted a 2.6% growth in revenues, to $5.5 billion, with a 5.4% increase in earnings to $272.9 million.

Those corporate numbers disguise real problems for the company, however. Honeywell sold a 16% share of General Electric Information Services Co. and 27% of its holdings in Cii-Honeywell Bull, a combined capital gain of $66 million. Excluding that figure from the company's revenues, earnings dropped 20% to $207 million.

Honeywell's most important component is Honeywell Information Systems, which generates over 30% of the company's revenues. In 1982, HIS sales dropped 5% to $1,684.7 million, while earnings tumbled 50% to $79.8 million. This sharp decline was caused by a large number of cancellations and deferrals of orders from customers in the recession-prone auto and steel industries. Consequently, HIS reduced its employees by some 2,700.

The company is hoping for something of a turnaround in 1983 and 1984, especially from the HIS component. That division was reorganized through most of 1982, culminating in the appointment of James J. Renier as president. The reorganized enterprise hopes to be more flexible in adapting to market demands and in using technology developed by Cii-Honeywell Bull.

Prospects for the company do look better than the continued poor performance would indicate. In 1982, HIS was awarded a 10-year contract with the Navy to supply $603 million worth of hardware, including 1,800 DPS 6 processors, 33,000 terminals, and 26,000 printers for shipboard nontactical use.

Honeywell can also look forward in the long term to revenues generated by two large-scale computer systems introduced in 1982. The DPS 88/81 uniprocessor-based mainframe is about four and a half times faster than anything the company had yet introduced, and the DPS 88/82 dual-processor model was about eight times as fast as previous models. The systems will not be ready until 1984, which gives competitors room to cut their prices and squeeze Honeywell before it can even begin shipping.

The company is hoping to diversify its product line through acquisitions; to that end, it purchased Disc Instruments, Executone/South Bay, Shield Protection, and Tetra Tech in 1982, and Votan in 1983. Eventually the company hopes to offer all of their products under the Honeywell name.

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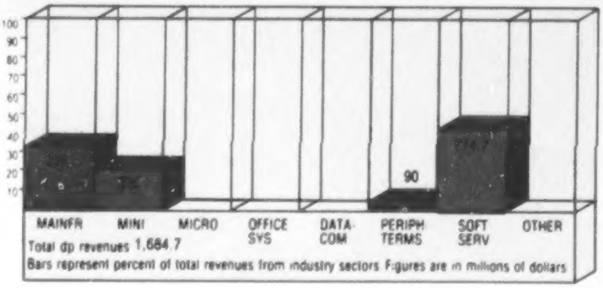

Total dp revenues 1,684.7

Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

HEWLETT-PACKARD COMPANY

3000 Hanover Street
Palo Alto, CA 94304
(415) 857-1501

Other companies would consider a 17.3% revenue growth rate and a 25% earnings growth rate a spectacular performance during a recession, but Hewlett-Packard's 1982 figures didn't ease the cautionary outlook of chief executive John Young. For a company that enjoyed 40% annual revenue growth in good times and about 20% in bad times over the past years, the $2.2 billion in data processing revenues seems modest indeed.

The recession's impact on HP computer operations was uneven. Minicomputer sales were up 37% to $588 million, even though HP does not have a true 32-bit minicomputer line, the only growth area for minicomputers. Personal computer revenues were up a solid 20.6%, but that's not an impressive amount considering the overall torrid PC market explosion. The weak economy's sharpest impact on HP revenues was in peripherals and software, a growth of 10.3% and 7.2% respectively.

Typical of Young's tightfisted attitude toward spending, HP's earnings growth exceeded revenue growth. Net income in the fiscal year that ended Oct. 31 was up 25% to $390 million, but it was not achieved without some pain: capital spending plans were slashed 25% to $362 million. Hiring limitations held the HP payroll to 68,538 persons. Research and development spending, the lifeblood of HP, increased 24.4% to $432 million in calendar 1982 and is now 10% of revenues as the company further positions its product line for the recovery.

Foremost among the new products coming from the labs was the new family of 32-bit desktop computers, the HP 9000, introduced in November. Proprietary silicon chip technology enabled HP engineers to squeeze the equivalent of 600,000 transistors onto a 128K RAM chip and 450,000 transistors on the cpu chip to assemble what is considered superminicomputer or mainframe processing capability in a breadbox. Touted as the ultimate workstation at less than $30,000, ideal for CAE/CAD projects, the HP 9000 was a landmark in the company's history.

Yet technological expertise is no guarantee of marketing success in the computer industry these days, and many question HP's ability to profit from the $100 million research effort behind the superchips and the 9000 family. Critics say decentralized marketing was a handicap in the small computer market: too many HP salesmen pushing different variations of basic product lines.

Recognizing the weakness, Young recently reorganized the multitude of computer segments into five coordinated groups. The streamlining should help the dp division's profit margins. With dp revenues now accounting for more than half of total HP sales, and the office and personal computer marketplaces the critical growth areas of the 1980s, improved margins are crucial for HP to continue its strong financial performance.

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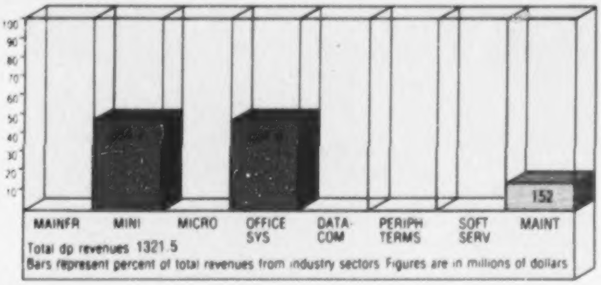

WANG LABORATORIES

One Industrial Avenue
Lowell, MA 08151
(617) 459-5000

The drumbeats of success banged loudly again at Wang last year. The company had higher revenues, higher profits, higher earnings per share, and more employees than ever. The company seemed impervious to both the worldwide recession and the more frenzied industry competition. Total corporate revenues, which had edged over $1 billion for the first time in 1981, soared to $1.3 billion, a 31% increase. That was less than the astonishing 48% rise the company experienced in 1981, but no one was complaining.

Profits passed $100 million for the first time. The company had expected to exceed that figure after finishing 1981 with $90.4 million, but even chairman An Wang probably didn't anticipate a 36.7% jump to $123.6 million. Earnings per share responded with a 29.9% rise, from 77 cents per share to $1. Wall Street's reaction to all this was bullish. Wang stock opened 1982 at 16¼ and closed at 29½, a 77% increase.

The company attributed part of its improved financial position to a dramatic rise in the level of internally generated funds through improved collection of receivables, better inventory management, and comprehensive tax planning. It expects further improvement this year, particularly in the management of inventories and capital. Wang has set a 1983 goal of 30% growth in revenues and earnings. One major New York investment house believes Wang can maintain a 30% to 35% earnings growth over the next three to five years, with considerably higher growth likely in a recovering economy.

After introducing a number of new products in 1981, Wang kept the production lines running in 1982. The company in May introduced its long-awaited Professional Computer. This low-cost product can function in three modes—MS-DOS (16-bit), CP/M (8-bit), or as a terminal. It allows users to access data from a host (VS, OIS, Alliance, or 2200) system and use those data in programs run on the desktop unit itself.

Wang was also active on the high end. It reduced the entry level of its VS distributed office systems family by introducing the VS 24 and VS 45 and, on the highest end, the VS 90.

The VS 25 and 45 are designed for first-time users of office dp in small- to medium-sized companies or the distributed processing environment of a large organization. The systems have all the high-performance features of the larger VS systems.

The VS 90 is the lower-priced member of the company's 32-bit superminis. The VS-90 can be equipped with up to 4 million bytes of main memory and 5.2 billion bytes of disk storage. It can also be upgraded to a VS-100.

Wang continued to stress its claimed position as the leading edge of office automation. With last year's figures available, no one seems willing to argue the point.

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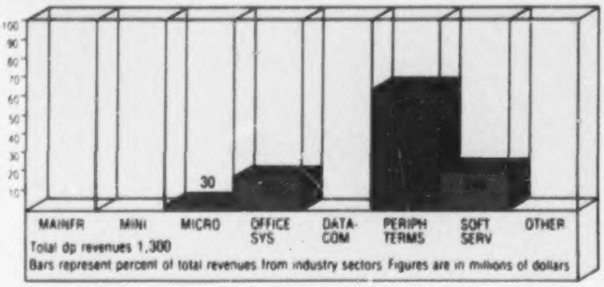

XEROX CORP.

P.O. Box 1600
Stamford, CN 06904
(203) 329-8700

Xerox Corp. has suffered hard times in the past 18 months as it struggles against tough odds to regain lost strength in the copier business and to establish momentum in the crucial office automation arena.

Earnings from continuing operations for 1982 slid 36% from the previous year, ending up at $423.7 million. The company attributed the poor results to a weak worldwide economy, fierce competition from Japanese vendors, a strong dollar, and heavy investments in new products.

Xerox made some significant moves in 1982, however, the most notable of which was the purchase of Crum & Forster, the New Jersey property and casualty insurance company, for $1.6 billion in cash and stock. The move was seen by analysts as a way to maintain a steady cash flow and to decrease Xerox's risk of being taken over as a pure technology company.

Xerox also continued to reduce its work force as a result of sluggish orders and a continuing general trimming instituted in 1981. A total of 9,500 people were let go in 1982, bringing the total work force to 109,940.

The company is estimated to have had data processing revenues of $1.3 billion in 1982, compared to an estimated $1.1 billion the year before. That total is thought to have come largely from Xerox's peripherals subsidiaries (Shugart Associates, Versatec, Kurzweil, among others) as well as from a fairly successful computing services subsidiary. DATAMATION estimates that total office systems revenues were $200 million in 1982, up substantially from $132 million in 1981.

The company's year in the all-important office systems market had its good and its bad points in 1982. On the plus side was an increasing acceptance by customers of the Ethernet local network, and slow but steady deliveries of the 8010 Star workstation.

The firm's microcomputer marketing efforts, however, fell far short of expectations because of what chief executive David T. Kearns admitted was a poorly executed distribution effort. Meanwhile, two top office automation executives left abruptly to start their own company. By all accounts, Xerox has a long way to go before its office system business is profitable, a fact conceded by the company, which has told analysts not to expect much of an upturn this year. Nevertheless, top management said it is committed to pursuing the elusive market.

Among other developments, the firm introduced a new line of small copiers, installed an optical disk storage system at the Library of Congress, beefed up its product line and marketing efforts in the nascent artificial intelligence field, and installed an experimental copy editing and layout system for the *New York Times*.

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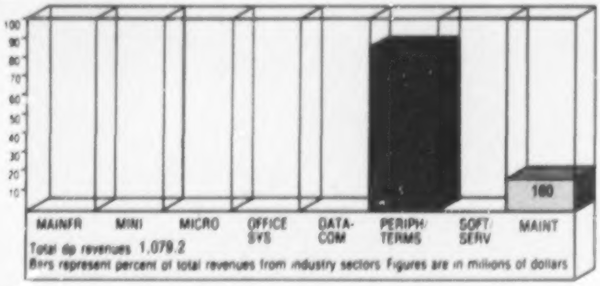

STORAGE TECHNOLOGY CORP.

2270 S. 88th St.
Louisville, CO 80027
(303) 673-5151

Optimism raged throughout STC in the early months of 1982. The company continued its string of quarterly revenue and earnings records, maintaining its position as a darling of Wall Street. Jesse Aweida, chairman, said in May that he was not "uncomfortable" with 1982 earnings estimates 40% higher than the $2.50 per share posted for 1981.

Then the outlook changed.

The strong demand for the company's disk drive memory systems melted during the summer of 1982, as the recession and renewed competition from International Business Machines Corp. intensified. Incoming orders dropped 58% for the first nine months of 1982 compared to the same period a year earlier. To match output to the reduced order level, Aweida had to take the unprecedented step of laying off 400 workers last year and another 500 workers in early 1983.

After several years of posting 50% annual revenue and net income gains, STC's 17% revenue increase to less than $1.1 billion was a distinct disappointment. A quality control problem, the sudden shortfall in orders and its impact on operations battered profits—net income dropped 21% to $64.7 million. By year-end the disappointing outlook knocked off more than a third of the company's stock market price.

Particularly embarrassing to STC was the in-the-field retrofit of disk-head assemblies of the 8650 drive that is plug compatible with the IBM 3350. STC technicians replaced the assemblies in the field and rebuilt them in the factory, at a pretax cost of $17 million. Another embarrassment was the discontinuance of the Virtual Memory System project. Software development problems repeatedly delayed the data storage management package.

The future good health of the company depends in large measure on the success of its new 8380 disk drive with 2,500 megabytes of memory. This is STC's higher capacity version of the IBM 3380 unit. Also high on observers' lists of significant new efforts was the optical storage disk project. Both products are to enter commercial markets this year and provide key sources of revenues in the future. As for 1983, Aweida expressed subdued optimism, forecasting a 10% to 15% increase in revenues and earnings.

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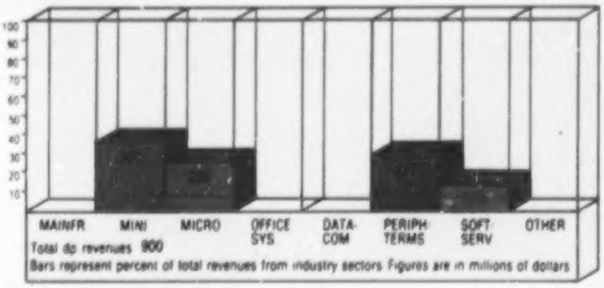

TEXAS INSTRUMENTS INC.

P.O. Box 22574
Dallas, TX 75265
(214) 995-3773

The data processing business at Texas Instruments had more triumphs and tragedies than a Shakespearean festival last year. The 99/4 home computer, ridiculed a few years ago for its limited performance and $1,200 price tag, flew off retailers' shelves in 1982 after it was marked down to a rebate-induced $150. Fred Bucy, TI president, bragged a few months ago that 1 million were sold, but the impact of an emergency retrofit in February because of a potential electrical malfunction remains to be seen.

The 61% increase in microcomputer revenues last year credited to the 99/4a unit was one of several pieces of good news for the company, but even that was dampened by the poor bottom line. TI's digital products group—which includes minicomputers, micros, peripherals, and non-dp gadgets using TI chips—isn't making much money. Last year, the company said, digital products cleared a mere $23 million on $1.2 billion in sales, or about even with the 1981 results and less than half the profit level of 1980. Company officials admit that the intense price competition in the home computer area came earlier in the product cycle than they had expected, an indication that the 99/4a is not a big profit contributor.

The depressed profit levels are caused by weaknesses in TI's other dp businesses. Minicomputer revenues dropped 5% to $300 million despite a steady stream of new products. Peripheral revenues also lagged the industry, up 1% to $267 million, according to DATAMATION estimates. Total TI dp revenues were up 12.5% to $900 million.

TI overall performed without much strength last year, except for its thriving defense electronics business. Sales were up modestly to $4.3 billion, but earnings were up an impressive 33%, to $144 million. TI's Defense Department business generated 24% of revenues but 52% of profits as the company's line of airplane and missile radar continued to win military contracts.

As the new year dawned, TI faced a number of good news/bad news situations. The home computer problem was followed a few weeks later by the introduction, to rave reviews, of a new personal computer, complete with a speech recognition box, priced below the comparable IBM PC. Then, just as TI's chip business started recovering from the weak economy, a manufacturing problem forced the company to recall 64K RAMs vulnerable to moisture damage, an embarrassment to a company that prides itself on manufacturing prowess. A surging order rate indicated that there is more good news than bad ahead for the pride of Dallas.

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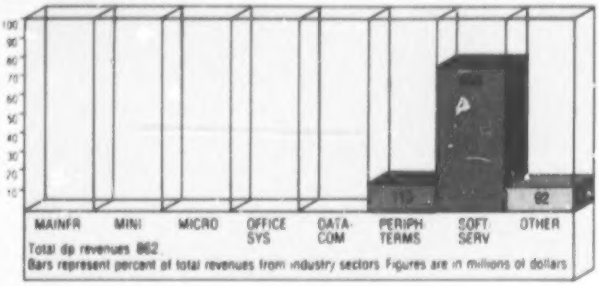

Total dp revenues 862

Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

GENERAL ELECTRIC COMPANY

3135 Easton Turnpike
Fairfield, CT 06431
(203) 373-2211

In its attempts to "bring good things to life," General Electric has managed to bring more than a few good things to itself. With its cash hoard of about $5 billion, GE has quickly and quietly positioned itself as a key contender in the very business in which it failed so spectacularly in the '60s. The emphasis is clearly on high technology, and analysts continually speculate on which computer-related company GE will gobble up next.

Over the past two years the company has acquired and disposed of business entities at an astonishing rate. During that time GE completed some 120 transactions involving acquisitions, joint ventures, and formations of new companies. It also disposed of 71 businesses that didn't fit its long-range strategy. Those transactions involved $1.5 billion—roughly $1 billion for acquisitions (such as IC-maker Intersil and CAD/CAM company Calma in 1981) and $500 million for dispositions (like the sale of its central air conditioning business last July). But the big bartering took place this January. Realizing that investments in coal and ore didn't mix well with investments in dp and datacom, the company made way for the sale of its Utah International Inc. mining subsidiary for about $2.4 billion.

The shift in market mix began back in April 1981, when Reginald Jones retired as GE's chairman, passing on his post to current chairman John F. Welch Jr. Both strong leaders, Jones and Welch preach different philosophies: Jones rallied for respectable and rising profits year after year; Welch wants ever-increasing share of market. Interestingly, both goals appear to have been met last year.

Despite a decline in total corporate revenues to $26.5 billion in '82 from $27 billion in 1981, GE's earnings climbed 10% to $1.8 billion from the year earlier's $11.7 billion. Such an increase on declining revenues was a feat few information processing companies performed during 1982.

In a year when many companies reported fattened revenues but starved profits, how did General Electric fare so well? The company took a strong dose of cost-cutting measures, including the trimming of its work force to 367,000 employees from the year earlier's 404,000 and reduction of R&D expenses to $1.6 billion last year from $1.7 billion in '81. Even on the leaner budget, the corporate R&D center in Schenectady, N.Y., saw completion of its $130 million expansion.

A significant part of GE's R&D investment is aimed at microelectronics. The company wants an even wider array of products and services—from industrial robots that "listen" and "see," to kitchen appliances that "think." With $5 billion in the corporate coffers and a goal of ever-growing market share, the question becomes: what market? Not even Wall Street analysts will hazard a guess on which high-tech company will be the next to satisfy GE's voracious appetite.

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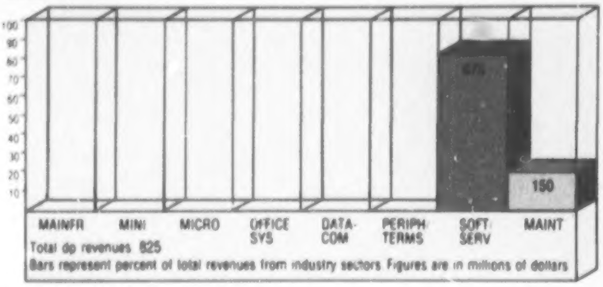

Total dp revenues 825

Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

TRW INC.

23555 Euclid Ave.
Cleveland, OH 44117
(216) 383-2121

The original concept of being a conglomerate was to protect earnings and revenue growth from the peculiarities of just one business. The recession of 1982 put that concept to the test. Cleveland-based TRW failed the test, finishing the year with a 3% decline in revenues to $5.1 billion, but a whopping 15% decline in earnings to $196.3 million.

All wasn't going too well for TRW in its industrial and energy group or its car and truck operations. In the dp arena, things apparently went sour between TRW and its Japanese partner Fujitsu Ltd. In early 1983, the partnership broke up, with Fujitsu taking control of the operation. (A number of TRW executives transferred over to Fujitsu.)

TRW reports to DATAMATION that its only dp operations are now its maintenance and service company and the credit analysis operation. The company says its credit service expanded to $675 million from $485 million for the previous year. The maintenance operation only increased to $150 million from $135 million. This small increase in maintenance is surprising, because so many manufacturers reported a much larger percent increase in their maintenance costs. This seems to indicate that TRW is losing market share. TRW's service operation is located in Fairfield, N.J., and has over 200 locations with 3,000 employees. It boasts over 80,000 customers at 250,000 different sites. During 1982, the service and maintenance operation took a new approach, and opened its first retail outlet in Dallas, aimed at local personal and home computer owners. This is a testing of the waters; if it is successful, the company may open others.

What will TRW do now that the Fujitsu deal has fallen through? Will it stay out of the dp business and concentrate on its components operation? Or will it simply remain in the services and maintenance business, and try to expand these? Most analysts expect the company to move further into dp, but they predict it will wait until some of its other operations are turning bigger profits before taking any new risks.

TRW's overseas dp business again fell into turmoil. In the past few years its Datacom division had the overseas marketing and distribution contracts from Datapoint, NBI, and other companies, but within a year each was dissolved as those companies expanded their own operations. Now TRW distributes Convergent Technologies workstations overseas, but the large equity positions in CT taken by Burroughs, NCR, and others probably preclude a TRW acquisition.

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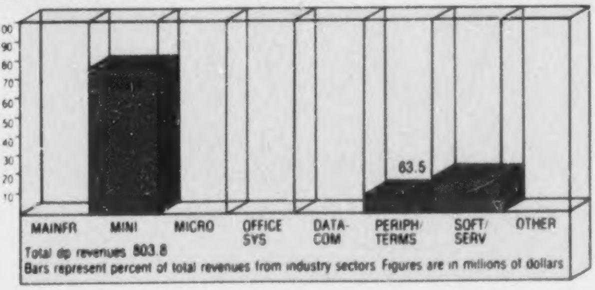

DATA GENERAL CORP.

4400 Computer Drive
Westboro, MA 01580
(617) 366-8911

Industry analysts have been having a lot of fun in the past two years dissecting Data General. After all, it's not too often that a company records revenues over $500 million in its 10th year of business and then falls flat on its face. From a high of $87 in mid-1980, Data General's stock tumbled—crashed, actually—to a low of $20 a year later. And while revenues increased in each of the last two years—to $803.8 million in 1982, a 5% gain over 1981—earnings slipped in 1981 and plummeted in 1982. DG's profits in 1982 were $12.9 million, a 75% fall from 1981 and a far cry from its 1980 peak of $54.6 million.

The problem isn't really that anything went wrong, per se. It was a huge corporation operating like a tiny startup. As a result, problems mounted. Where DG once was the technological leader in minicomputers, it came in over a year late with its 32-bit Eclipse MV/8000 and almost as late with its midrange MV/6000. Digital Equipment and Prime took advantage of that lateness to build their bases, while DG languished.

That's only half the story, however, and the other half indicates that Data General's downward spiral may soon be reversed. Management shake-ups took place, resulting in a senior team with more experience running large corporations. The company's internal structure was fundamentally reorganized in 1982 into Technical Products, Small Business Systems, and Information Systems divisions. The restructured sales force is now more attuned to end users than to OEMS.

The company also hiked its R&D budget 13% to $84.5 million, or 10.5% of corporate revenues. The fruits of that effort may be particularly sweet to Data General: the Eclipse MV/4000, introduced in November, was introduced only about six months later than DEC's comparable VAX-11/730; that is as close as DG had come in the 32-bit world to catching up with DEC. More important was the company's March 1983 announcement of the MV/10000, the top end of its superminicomputer line. The MV/10000 has about twice the power of DEC's biggest VAX and has set an industry standard for supermini performance and price. Neither DEC nor Prime has as yet introduced a competitor.

Data General has also made considerable strides in the software arena. In past years, DG software did not sell well because the company's hardware went primarily to OEMS; by 1982, fully half of DG's MV/8000 sales went to end users, and as a result, software picked up considerably. The Comprehensive Electronic Office, an office automation software system introduced in November 1981, was something of a sleeper product in 1982, selling moderately while winning excellent reviews from its users. In February 1983, Data General announced that E.F. Hutton was purchasing $40 million of the CEO software.

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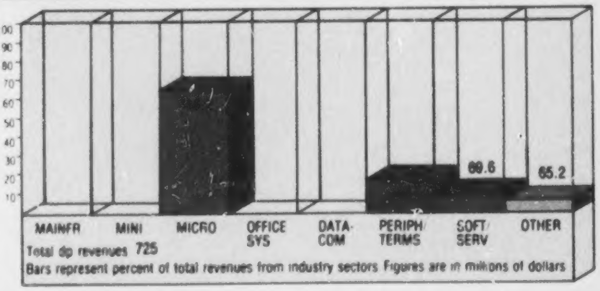

TANDY CORP.

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

It was life in the fast lane all over again for Tandy as the giant consumer electronics retailer continued to cash in on the personal computer craze that's put dollar signs in the eyes of the humblest hardware vendors. Continuing its sales streak, Tandy chalked dp revenues of $725 million last year, a 58% increase over 1981. Corporate earnings were up 23.3% to $254.1 million.

There's no doubt about it, things at Tandy are just fine, despite the recession and despite its growing number of rivals in the microcomputer market. The company's success in the PC business is largely due to its worldwide distribution network, which is the envy of every PC maker. The object of all that envy is of course Radio Shack, Tandy's retail consumer electronics chain that has captured the fancy as well as the finances of a whole new breed of would-be computer users.

Tandy's microcomputer sales in calendar '82 totaled $466.2 million, a 59% improvement over 1981. Peripheral and terminal revenue reached $124 million, up nearly 47%. The biggest growth area, however, was in software. The company, which has gradually learned to appreciate the programming side, boosted its software sales to $69.6 million last year.

Software has indeed become more important to Tandy, particularly programs aimed at its target market. To satisfy that market, the company is developing home educational software for preschool through high school youngsters. It's also going after software to support home applications such as filing, home management, word processing, and communications/videotex.

On the disk front last year, Tandy agreed to buy 50% of Texas Peripherals Inc., the joint disk venture it launched with Datapoint back in 1980. During FY '82 the company also acquired Memorex's Consumer Products Division—a move that should strengthen its magnetic media muscle.

A significant move in Tandy's history came when it decided to set up computer departments in various Radio Shack stores. There are currently over 450 of these setups, each staffed by an on-site marketing representative. The company plans to open 125 more computer centers in 1983.

In making such a decision, Tandy used both hindsight and foresight. The 62-year-old company, which started out peddling leather and other crafts, sees more and more of its total sales stemming from the computer segment.

Most of those sales will still be in the consumer sector. While the company has recently come out with a new portable, battery-powered workstation for executives, it remains to be seen whether the wonder of the micro world can dazzle or even make a small dent in the office market.

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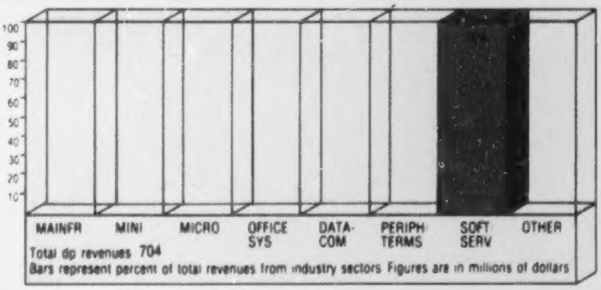

AUTOMATIC DATA PROCESSING INC.

405 Route 3
Clifton, NJ 07015
(201) 365-7300

ADP was in the limelight last year as chairman Frank R. Lautenberg left the company he cofounded in 1953 to take over his new duties in the nation's capital as U.S. senator from the State of New Jersey. Returning to the chairmanship of ADP was Henry Taub, who in 1949 started the small, privately held predecessor to the public company that is today a leader in the computer services industry.

Last year also saw ADP leapfrog dp services challenger Computer Sciences Corp. for a higher rung on the DATAMATION 100 ladder. ADP's total dp revenues for calendar '82 came in at $704 million, clearly ahead of CSC's $683.4 million total. While ADP's revenues climbed 14.8% from the $613 million in 1981, its net profit rose 11.1% to $60 million from 1981's $54 million. Those earnings are even more impressive in light of R&D expenses, which rose 19% over 1981, for a total of $25 million.

During its fiscal year, which ended June 30, ADP slowed its acquisition pace from the year-earlier level, purchasing only three companies and a majority interest in a fourth compared to 1981's string of seven companies. Fiscal 1982's total transaction volume approximated $4 million in cash and stock, plus additional payments contingent on future performance of the acquired companies, while the fiscal '81 purchases cost about $16 million in cash plus the additional pay-out contingencies.

ADP in '82 gobbled up a firm in California, National Healthcare Administrators Inc., which provides employee medical benefits administration; the major interest in Rechenzentrum Frankfurt KG (RZF), a computing service business operating in Frankfurt and Hamburg, West Germany; and the Houston and San Antonio dp operations of Computer Statistics Inc., which provides payroll and accounting services. On the flip side of the acquisition coin, ADP in fiscal '82 sold, for a small net gain, its income tax processing service and its commercial operations in France. These operations had combined revenues of about $12 million and a small loss.

Commercial Services is ADP's oldest and largest group, accounting for slightly more than half of the company's revenues. Despite reduced transaction volume caused by the weak economy, the group continued to grow well in fiscal '82, adding more new clients than in any previous year. ADP's Banking and Thrift group, which serves over 500 financial institutions from eight regional centers, saw services expand last year to include a new nationwide shared-ATM network with point-of-sale and debit card capabilities. New to the Network Services division in 1982 was the enhancement of its nationwide datacom network, Autonet, to support datacom services for other ADP divisions as well as outside companies. All in all, to well over 100,000 companies and financial institutions, ADP has truly come to be called "The Computer Company."

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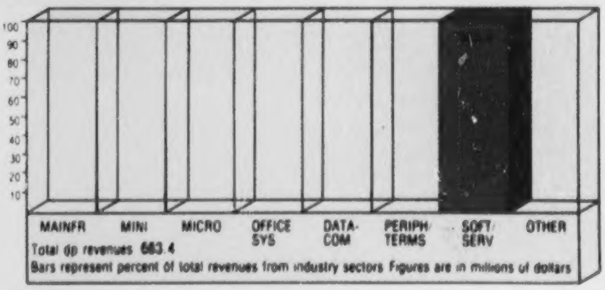

COMPUTER SCIENCES CORP.

650 N. Sepulveda Boulevard
El Segundo, CA 90245
(213) 615-0311

It should be the best of times for Computer Sciences Corp., but it isn't. Revenues and earnings growth should be on a fast track as its number one growth customer, the military, increases its budget, but competition in CSC's contract services and software businesses plus some special problems leave CSC managers fighting several fires at once.

Last year CSC dp revenues increased 9.3% to $683 million. Contract services—providing specialized programming work for local, state, federal, and foreign governments—continued to show modest gains; revenues increased 6.8% to $512 million. Software revenue, mainly timesharing and database sales, increased sharply, up 17.9% to $171.3 million, but profitability lagged because of startup costs for its new data center and product line expansion. The apparently impressive 15% increase in net earnings to $19.7 million is in part due to a write-off last year.

Slow growth in the contract business is partly caused by CSC's problems with its biggest customer, the federal government. Defense, NASA, and civilian agency computer support and software development contracts produced about 57% of CSC's fiscal 1982 revenues, down from 64% in 1980. The appeals court reversal of a "not guilty" 1980 criminal case against CSC officials, over questionable pursuit of civilian agency contracts a decade ago, went from the Supreme Court back to the federal court for retrial later this year.

And the financial impact of the case continues. Several "recompeted" contracts were lost to other companies. CSC efforts to expand its DoD business from its traditional NASA base met with limited success: big contract awards elude the firm while it continues to win small ones. Project VIABLE, a $656 million Army package, went to archrival Electronic Data Systems, while CSC won a $38 million Navy contract for its research laboratories accounting department.

CSC's government troubles are not limited to the aforementioned. A five-year, $20 million contract from the Tennessee health department for processing Medicaid claims was canceled after one year. CSC president William Hoover blamed part of the problem on the former claims processor, ESC, and insists the loss is not serious.

Aggressive new marketing approaches began to bring dividends for CSC. International sales comprised 18% of total revenues in fiscal 1982, up from 9% in 1978. The Infonet timesharing service is expanding its database activities to increase demand for its dp power. A new distributed network service, electronic mail, and a package deal for access through a microcomputer are part of the CSC effort to break into new markets.

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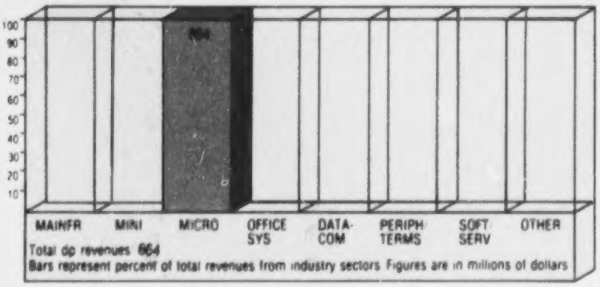

APPLE COMPUTER INC.

20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

The micro market has been changing so rapidly that even those first to the market can barely keep up. Innovations abound, while increased competition from the industry's giants has curbed what was once automatic sales growths of fantastic proportions. Even worse, competitors and imitators have made the market so crowded that margins are down. Apple had to respond to all these pressures during 1982. Its performance was good, but not as good as Apple had become accustomed to. For 1982, total revenues grew by 65.5%, a far cry from the 142% increase of 1981. Profits also slowed, up 55.5% versus the 176% increase of 1981. Sales for 1982 totaled $664 million, and profits came in at $61.3 million.

Without question the biggest threat to Apple came when IBM entered the market. DATAMATION estimates that during 1982 IBM captured about $500 million in personal computer sales. Industry observers believe that if IBM hadn't entered the market, a good deal of these sales would have been Apple's.

Besides IBM's entry, Apple had a struggle keeping its machines out of discount computer stores during 1982. This was apparently at Catch-22 situation for its dealers. First of all, Apple encourages the dealers to buy in quantity by giving large volume discounts. The dealers comply, but in an uncertain economy they are unwilling to hold inventory for too long. They then start calling up the local discount store and unloading some of their Apples for a modest profit. Apple's management feels its whole marketing strategy is being compromised by this practice, and it's looking for ways to stop the discount dilemma. Industry experts doubt that this is possible because the practice is so widespread it's impossible to pinpoint the culprit.

Meanwhile, sales of the Apple II became a source of dealer criticism. The dealers were dismayed at some of Apple's promotions during the Christmas season, when special price reductions increased Apple's sales but reduced dealer margins, which is of course the opposite of Commodore's philosophy.

Apple is pinning its future growth on Lisa as well as on its improved Apple IIe, both announced in early 1983 at Apple's annual meeting. The Lisa, priced just under $10,000, is a 16-bit personal office system featuring integrated common office functions and advanced graphics. Industry observers were generally left unimpressed by Lisa, feeling it fell short of the mark of offering superior performance for a conservative price.

The Apple IIe, however, met with more enthusiasm. Priced at about $2,000 for a package including peripherals, it has an expanded keyboard, 64K bytes, and a simplified circuit board. The big dilemma for Apple during 1983 will be to crack the office market while not losing its traditional market to aggressive newcomers. On both counts, the outlook is uncertain—made even more so by that spunky P.C. from IBM.

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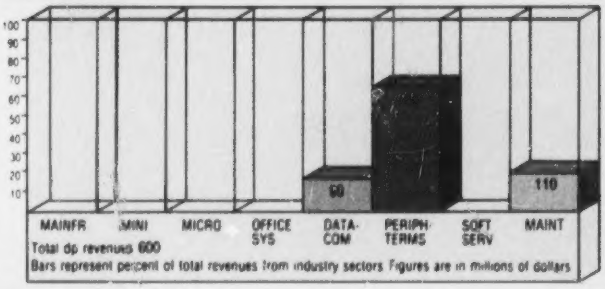

ITT CORP.

320 Park Avenue
New York, NY 10022
(212) 752-6000

Not even 3% of ITT's corporate revenues come from dp, but that still represents some $600 million in 1982, a 30% increase over 1981. By comparison, the rest of ITT is not doing as well. Corporate revenues were down 6% to $21.9 billion, and some 41,000 employees departed without replacement. The more streamlined operation did manage to boost profits 4% to $702.8 million.

ITT's dp operations are composed of two subsidiaries, both acquired in 1978 when the company was diversifying its business markets. Qume Corp. manufactures and markets character printers to the oem and end-user markets; in addition, it makes and sells data terminals to dealers, and printwheels and ribbons to the distributor market. In 1982, Qume introduced a modular daisywheel printer that is compatible with a wide variety of business mini and microcomputer systems.

ITT's second entry in the dp field is ITT Courier Terminal Systems Inc., which has sold more than 200,000 display terminals in its history. Courier introduced the SNA model 7601-1 remote terminal controller and began first shipments in November. The controller is diskette-based and can communicate at up to 9,600 baud with a host system through a telecommunications network using SNA/SDLC. Up to 16 Courier displays (Type A, Type B, or the new color version) or printers can be attached to the 7601-1.

ITT is indirectly involved with dp and office automation in several other operations. In August, its World Communications unit introduced a Faxpak service that makes it possible for incompatible facsimile machines to talk with one another. It permits communication between low-speed and high-speed machines, and can be used to broadcast a single transmission with a number of fax machines.

Early in 1982, ITT merged its World Communications, World Directories, Publishing, and United States Transmission Systems into the Communications Operations and Information Services (COINS) group. The new entity offers long distance telephone service, record and facsimile transmission, telex, electronic mail, and information/database, directory, and software application services. Late in the year, ITT acquired Dialcom International Inc., an electronic mail and information retrieval systems provider; Dialcom was also merged into COINS.

One of ITT's largest businesses is telecommunications, with related hardware sales accounting for 22% of the corporation's revenues. Although revenues declined 13% and profits dropped 12% in 1982, the company had reason to be optimistic. The System 12, ITT's first fully digital telephone switch, was delivered in 1982 to telecommunications authorities in Belgium and West Germany.

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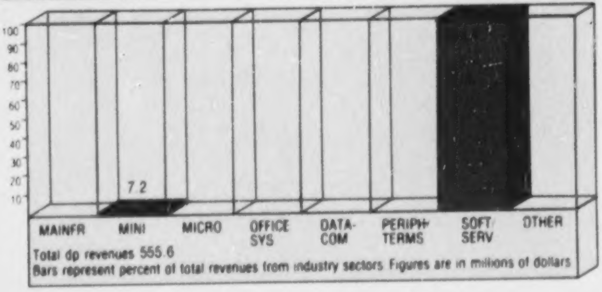

Total dp revenues 555.6
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

ELECTRONIC DATA SYSTEMS CORP.

7171 Forest Lane
Dallas, TX 75230
(214) 661-6311

Two decades after Ross Perot parted with $1,000 to create EDS, the company hooked a big one. In fact, nothing in the history of the computer services industry has been larger than the $656 million, 10-year VIABLE contract awarded by the U.S. Army. The project, which began in April 1982 and will take three years to build, will provide an integrated nationwide computer network that will revamp the Army's information processing capabilities. Forty-seven military bases will have access to computer power at five regional dp centers, instead of relying on current standalone computers at bases throughout the country.

"VIABLE was the perfect 20th anniversary for us," Perot said. "We were the underdog." Indeed, EDS and its software supplier, Applied Data Research, weren't even on the oddsmakers' board against the mighty team of Computer Sciences Corp. (CSC) and IBM.

Winning VIABLE was only the best of the good news that made EDS' 20th year its finest. Total dp revenues in calendar year 1982 rose 15.6% to $555.6 million. Processing services, EDS' mainstay, accounted for $548.4 million of that business. That represents a 15.7% leap over 1981.

The only negative chord was struck by minicomputer sales. EDS in 1981 had obtained revenues for the first time from hardware sales, with $6.9 million from the Centurion Data Corp. of Richardson, Texas. Centurion's MicroPlus Business Management Systems was sold through a dealer network. Centurion in July 1982 was absorbed into EDS' Commercial Systems Group. Sales for the year totaled only $7.2 million, less than a 1% increase over the previous year.

All other signs were positive. Total corporate profits were up 27% to $53 million from 1981's $41.7 million. Earnings per share jumped nearly as much, $1.91 per share compared to $1.54 per share in 1981.

EDS was also active on the acquisition front. It finished the year with a total of 13. By purchasing four small credit union systems, the company added 1,000 credit unions to its customer list. Now more than 2,200 credit unions use EDS computer systems to service the accounts of 6.3 million members. Last year, the total stood at 3.2 million members.

Banking customers also multiplied. Seven large banks and thrift institutions signed or extended contracts with EDS ranging from five to eight years. Six hundred banks and thrifts now avail themselves of EDS' range of services.

And don't worry about EDS running out of work to do. The company's long-term contracts give it a backlog of business exceeding $2 billion. That's enough to keep a company busy for a few years.

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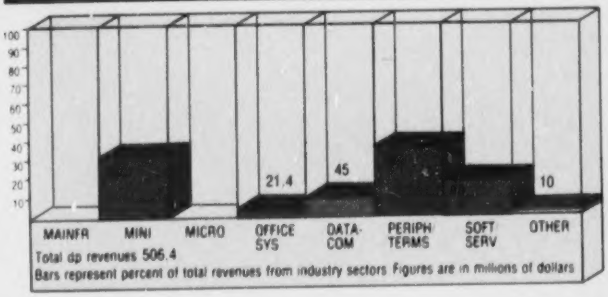

Total dp revenues 506.4
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

DATAPOINT CORP.

9725 Datapoint Drive
San Antonio, TX 78284
(512) 699-4428

It will be a long time before Datapoint will forget 1982, the worst year in the company's history. The onetime shining star of Wall Street became embroiled in a marketing scandal that sent its stock plunging to $12 from $67.50 in three months and cast long-term shadows over the company's credibility.

Datapoint suffered from an overriding dogma of quarter to quarter growth, resulting from a string of 39 quarters with record profits. By January 1982, the company's marketing staff was under such heavy pressure to boost sales despite the lagging economy that, according to reports, they resorted to increasingly shady measures that finally collapsed. In order to credit shipments as revenues in a quarter about to close, marketers sent shipments to customers who hadn't yet met Datapoint's credit requirements, used their own money to pay for warehousing that distributors couldn't afford, and even sent hardware to a mythical "Joe Blow."

Once these practices became known, Datapoint's management took strong steps to eliminate them and restore order to the company. Five executives were fired and one demoted, and the company's books were finally balanced by charging some $15 million of revenue from prior quarters against its April quarter, resulting in a $22.9 million quarterly loss.

Part of the recovery was the result of new products introduced in 1982. These included the 1560 small business computer system introduced in October. The 1560 was the first microcomputer that could use the company's ARCnet local area network. The company also introduced a telex management system, a laser printer, a color graphics system, a video workstation, and the 8600 business computer system. Plans for releasing ARCnet on Tandy's Radio Shack computers continued on schedule, and in early 1983 ARCnet became a TRS-80 option.

Management at Datapoint was revamped during the year, with Edward P. Gistaro elected president and chief operating officer. When all of these pieces are put into place, Datapoint comes out of 1982 pretty much exactly where it went in. Total corporate revenues were $506.4 million, practically identical to the $506.2 million in 1981. But where the company turned a $48.4 million profit in 1981, the same revenues yielded a $17.4 million loss in 1982—about minus 87 cents a share.

Datapoint is looking to the future with its small 1560 and other products. The company spent some $44.6 million on R&D in 1982, compared to $36.5 million in 1981, and boosted its work force by 900 workers. The company—and Wall Street—will not forget 1982 soon, but Datapoint has made a turnaround both in its practices and in its financial picture.

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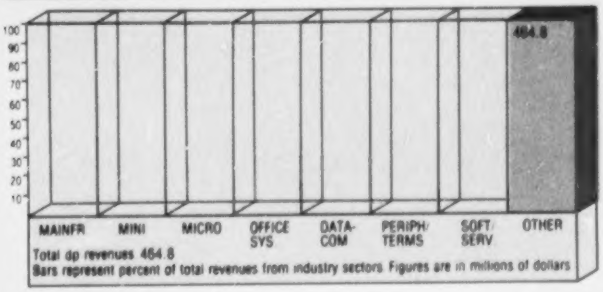

Total dp revenues 464.8
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

COMDISCO INC.

6400 Shafer Court
Rosemont, IL 60018
(312) 698-3000

Following its philosophy that "whatever IBM does, you have to make sure it won't hurt you," Comdisco came through 1982 seemingly unscathed by IBM's price cutting and new product introductions. During a year when other remarketers of new and used IBM equipment fell on hard times, Comdisco reported a revenues increase of 35% to $464.8 million. Even more impressive was the earnings rise of 46% to $32.2 million.

As the largest dealer in the IBM remarketing business, Comdisco offers customers a wide range of financing options—purchase, purchase leaseback, or leasing under a variety of terms. The company reported a total of 7,000 transactions during 1982.

Holding true to its philosophy, the company cashed in on IBM's initial deliveries of its new 3081 processor—Comdisco not only participated in the leasing of the new system, but also capitalized on the remarketing of the displaced IBM 3033 processors. This marketing effort boosted the company's lease base by 31%.

Comdisco chairman and founder Ken Pontikes explains his business this way: "We are traders and dealers of equipment. Typically, an IBM move will hurt one side of our business, but the other side will pick up. We're not committed to doing business just one way, and we can react to any change in the market."

To help protect the company from IBM's changing marketing strategy, Comdisco itself has moved into new areas. One new business area is the relocation of dp centers, and another is disaster control planning and consulting. These relatively new endeavors show signs of a good future.

One aspect of the company's business that is under a cloud is its financial services operation, which was formed to take advantage of certain tax laws. Here, business boomed with the Economic Tax Recovery Act of 1981, which provided "safe harbor" or pass-through tax advantages. Congress has recently moved to shore up this loophole, but Pontikes remains unperturbed: "They are always changing the tax code, but we can normally figure out a way to legally do a deal that will satisfy all parties." The financial services operation contributed $73.9 million to 1982 sales, or 15%, so even if Pontikes can't get around the tax code, the loss of this business won't make a big dent in Comdisco's business.

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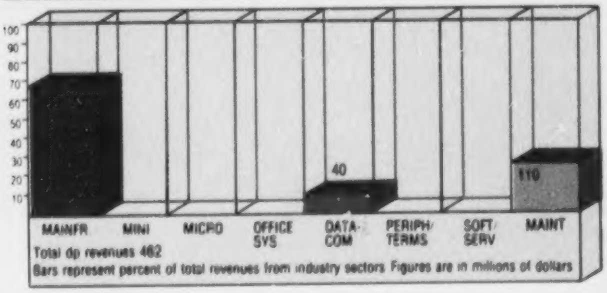

Total dp revenues 462
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

AMDAHL CORP.

1250 East Arques Avenue
Sunnyvale, CA 94086
(408) 746-6000

After two solid growth years, Amdahl ran into rough waters in 1982 and ended the year with a slight increase in revenue—but a huge decrease in profits. While revenues inched forward 4.3% to $462 million, income tumbled 75% to $6.8 million, or 33 cents per share. Part of the company's problems can be attributed to the sluggish economy, as more customers decided to lease rather than buy Amdahl equipment. Sales actually declined 4% to $317 million, while leasing and maintenance revenues climbed 30% to $145 million. Yet Amdahl's pricing structure throughout 1982 discouraged leasing, as sales margins declined by 9% while leasing margins increased 4%.

Amdahl's corporate picture is colored mostly by its mainframe and storage businesses, which DATAMATION estimates generated $312 million in 1982, a decline from $334.5 million in 1981. The problems encountered by Amdahl's mainframe business were more of their own making than results of economic pressures or other external factors. First customer shipments of the 5860 uniprocessor mainframes—the first of the new 580 line to be introduced—were delayed four months because of engineering complications the company encountered with the design of the I/O processor. During that period last spring, IBM's sales force diligently convinced many Amdahl users to switch rather than wait, and as a result, Amdahl's market share declined during the year. (Amdahl's market share was also hurt by IBM's announcement of the 3084, which eclipsed Amdahl's 5880 as the most powerful general purpose computer available.) Since deliveries finally started in the third quarter, about 25 of the 5860s were installed in 1982. The company expected to catch up on its delivery schedule early this year.

Amdahl believes that maintaining IBM software compatibility is the only route to survival in the mainframe business, since customers can be won away from IBM without software conversion. Yet as the 5860 debacle shows, the same compatibility can be a road to ruin.

Amdahl entered the data communications field two years ago with its acquisition of Tran Telecommunications Corp., a worldwide supplier of public and private digital communications network equipment. The Communications Systems Division, as it's now called, added several new products to its line of modems, multiplexors, and communications controllers during 1982. Unlike the mainframe division at Amdahl, DATAMATION estimates, the Communications Systems Division grew briskly in 1982, with $40 million in revenues, or a 56% jump over 1981.

Amdahl plans to continue keeping up with IBM in the mainframe and communications businesses and has for eight consecutive years increased its R&D budget to keep its product line up-to-date. In 1982, Amdahl spent $81 million on R&D, 8% more than in 1981 and 17.5% of the company's 1982 revenues.

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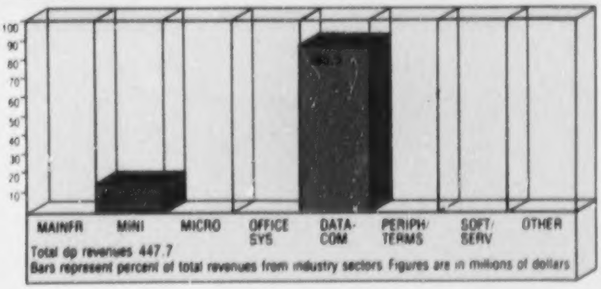

ROLM CORP.

4900 Old Ironsides Drive
Santa Clara, CA 95050
(408) 988-2900

The December introduction of its PhoneMail voice store-and-forward messaging system, along with the summer announcements of the Distributed Digital Network products, are key indicators that Rolm should remain a leader in the PBX field. Other indications are its financial results for 1982.

The company came in with a healthy 35% increase in revenues to $447.7 million from $331.5 million in 1981. Most of its revenues, or 86% in '82, came from sales of PBX and CBX products. Those sales were up 42% last year to $385.5 million from the previous year's $271.8 million.

The remaining revenue producers are Mil-Spec minicomputers, which contributed $62.2 million in 1982. Users of these systems built to military specifications saw a stream of new products last year. Two examples are the Serial Multiprocessor Communications Adapter (MCA) and the 4150 disk subsystem. The Serial MCA provides the capability to connect Rolm computers in a network through a high-speed, fiber optic link. The 4150 is designed to operate in severe computer environments such as airborne operation at altitudes up to 30,000 feet.

Revenues weren't the only reason to boast. Profits met all expectations as well, climbing 26% over calendar 1981's $26.2 million to reach $33.0 million in '82. Per-share earnings rose from $1.50 to $1.85.

Rolm remains both a technical and marketing leader as it continually upgrades the hardware of its CBX architecture as well as adds software packages and protocols that facilitate, automate, and control telephone use. Additionally, since an estimated 75% of CBX sales in fiscal '83 (which ends in July) will be through the company's own marketing organization, the Rolm Operating Companies or ROCOs, Rolm appears ready to wage war with American Bell, Northern Telecom, IBM, and others for market share primarily in the North American business telecommunications systems market.

Rolm is placing its office systems bets on a market trend toward diversity, not standardization, in office equipment, leading to a customer need for objective integration of the office into a local area network. The company claims it has installed more integrated voice and datacom networks than all of its competitors combined. Customers include such heavyweights as Westinghouse, Dolby Labs, and Evans and Sutherland Computer Corp.

The California company has also made a major commitment to networking. Its Office Systems Division last year announced a synchronous data terminal interface to connect the CBX with synchronous terminals and computers at switching data rates up to 56Kbps. It also announced an interface to X.25 packet switching networks, extending the Rolm integrated datacom capabilities into public and private data networks.

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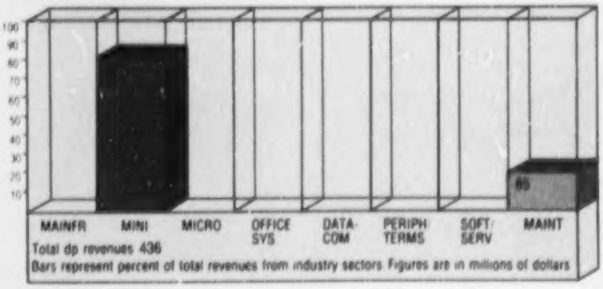

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

Prime continued to prosper through the recession largely because of its strong end-user positioning. Total sales climbed 19.4% to $436 million, helped considerably by a steep increase in support/maintenance revenues that accounted for around 19% of total sales for the year. Minicomputer revenues didn't grow as much as total revenues, climbing only 13.5% to $351 million, and reflecting increased competition in the 32-bit sector from such companies as DEC and Data General.

Net income growth slowed down a little over previous years but still rose a healthy 18.4% to $45 million. Earnings per share were up by the same percentage, and its stock had a good year on Wall Street, closing at 34⅞—up 47%.

A good insight into the company's future can be gleaned from the $12 million federal government contract it secured in the latter part of the year. The client—the Geological Survey—will tie networks of Prime minis into its own mainframes. The minis will share multiple databases among themselves as well as with the hosts. At the same time, each mini will handle multiple local tasks—either scientific or commercial—on its own.

Prime's future strategy will be to add new workstations, office automation, and CAD/CAM applications to the mix, and hammer away at the price/performance curve every year.

As a prelude to this, Prime ended a quiescent year with a flurry of product announcements. Included were a new CAD workstation, the PW 200—Prime's debut in the under $100,000 class—which combines Prime hardware with Medusa software. Unveiled in November was a new Electronic Design Management System, a shared library system that allows large CAD/CAM design teams to work in a fully integrated DBMS environment.

Also announced last year was a new commercial distributed data processing system, the 2250, which the company said "solidified" its commercial thrust. Since Prime is known for its orientation to scientific/engineering clients, this was clearly viewed as a marketing and imaging shift. The company also departed from standard norms by unveiling a new block mode terminal, the $1,595 PST 100, which was the first terminal to be wholly designed and built by Prime and, some say, heralds a greater push into vertical integration of its manufacturing.

Another highlight of the year was the appointment of W. L. Brubaker as vp of sales and service and a member of Prime's elite operating committee. That effectively completed the restructuring of Prime's senior management, initiated late in 1981 with the appointment of former IBM executive Joe Henson as president and ceo. Senior management at Prime, as at competitor Data General, is now heavily weighted with IBM backgrounds. The new stability, which is evident in the company's new strategic positioning, seems to have pleased investors.

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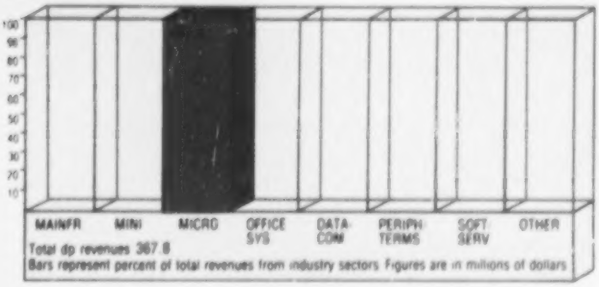

COMMODORE INTERNATIONAL LTD.

Valley Forge Corporate Center
950 Rittenhouse Road
Norristown, PA 19403
(215) 666-7950

Consumer acceptance of personal computers came of age in 1982. The market was crowded with new products and increased competition. At year-end, Commodore surprised its competitors and Wall Street analysts by emerging as the clear victor, with over 1 million of its Vic 20 machines sold. This represented over half of all sales of these lower-priced models.

These sales pushed Commodore's 1982 dp revenue up almost 100% to $367.8 million. Corporate profits made even larger strides, up 107.6% to $65.8 million. The profit picture is all the more impressive considering that Commodore dropped the price on its Vic 20 to $140 from $200 during the year.

Commodore isn't about to rest on its 1982 laurels. The company has big plans for new products and new markets in 1983. First is its more advanced personal computer, the Commodore 128, priced at $795 with a 16-color display and a 128K memory. While this is double the Apple IIe memory, the 128 is selling at a little more than half the price.

Commodore is aware of the growing market for portable computers and has announced two new machines in this category. Interestingly, these portable machines are to be compatible with the IBM Personal Computer.

In addition, Commodore is following Apple into the office automation market. It plans to have two very powerful computers that include on-board floppy disk drives and 128K and 256K of RAM. All of Commodore's new computers are expected to be price competitive with those on the market.

One area where Commodore has been criticized is software, and the company has moved to change that. Commodore hired Sigmund Hartmann from TRW Inc. as president of its newly expanded software division. The company plans to double its software personnel and produce products for all its computers.

One of Commodore's secrets of success in Europe (where it's the market leader) has been the pampering of its dealers. The company has continued that practice in the U.S., and dealer loyalty has become very strong. During 1982, for example, when Commodore cut the price on its Vic 20, the dealers were guaranteed their higher cut on any machine still in inventory. Therefore, the company and not the dealer took the loss. Analysts expect that may have cost Commodore over $1 million during 1982, but as the marketplace becomes more competitive, dealer loyalty could be worth much more than that.

Wall Street remains divided on Commodore, with some security analysts praising it and others preaching caution. Commodore also gets criticism from dp purists because it's not a high-technology threat. But it seems oblivious to these changes and remains confident it can keep up with the fast pace.

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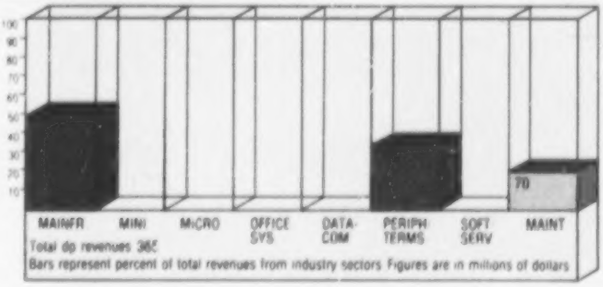

NATIONAL SEMICONDUCTOR CORP.

2900 Semiconductor Drive
Santa Clara, CA 95051
(408) 721-5000

Things went from bad to worse for National Semi in 1982. Of course, 1981 wasn't much fun, but at least the company posted a profit. At the close of 1982, despite slight increases in both total corporate ($1.2 billion) and dp revenues ($365 million), National Semi showed a drastic decline in profits. The $23.8 million profit of calendar 1981 disintegrated into a $15.4 million loss, a drop of 647%. Earnings per share, $1.04 in 1981, fell to a loss of 68 cents, a decrease of 653.8%.

The red ink forced considerable reshuffling within National Semi, which, despite the difficulties, continues as one of the world's largest manufacturers of integrated circuits (ICs). National implemented shutdown days to control inventory buildup, curtailed its capital spending, and retrained and shifted employees (and actually increased its total by 7%).

The situation appeared to be improving in the latter half of 1982, with demand for the company's semiconductor components and systems increasing. But the positive signs were somewhat negated by the continuing strength of the dollar in Europe, which adversely affected the company's earnings performance.

Attempting to improve its position in the point-of-sale (POS) scanner systems, in which it ranks second to NCR in total supermarket installations, National announced this January an agreement to acquire Data Terminal Systems in a friendly tender offer of $50 million. Data Terminal produces individual checkout terminals used in the retail market. The merger was in the final phase and was expected to be completed in May.

In response to the fluctuating international scene, National made two other moves in January. It signed a letter of intent to transfer its 49% interest in Eurotechnique, a joint venture in France, to Thomson-CSF, a French concern. The company also signed a multiyear joint venture agreement with OKI Electric Industry, a Japanese electronics concern, to develop and produce advanced computer chips. National Semi will make OKI-designed 64K RAM memory chips and market the devices.

Finally, National Semi threw in the cpu on mainframes. The company in February announced its National Advanced Systems Unit would cease the manufacturing of mainframes, which it had been making since 1977. National Semi will continue to sell general purpose computers made by Japan's Hitachi Ltd. National's AS/6100 will be replaced by Hitachi's AS/6600. The 4-megabyte, five-channel systems, selling for $370,000 to $580,000, will be available this fall.

"It remains difficult to say with full confidence that the corrections in some key economic indicators worldwide are harbingers for a successful 1983 for the industry or for National," president Charles Sporck told stockholders.

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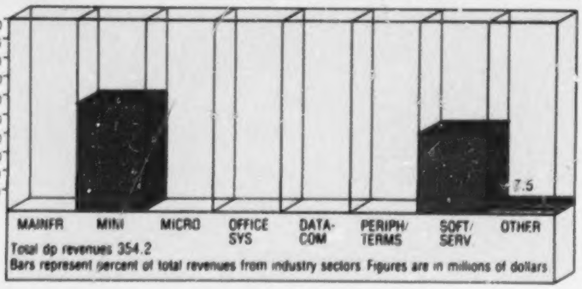

MANAGEMENT ASSISTANCE INC.

560 Lexington Avenue
New York, NY 10022
(212) 909-1400

Management Assistance Inc., continued in the doldrums again last year, bogged down by sluggish sales of its Basic Four product line. Revenues, which reached $349.1 million in calendar 1981, inched up only 1.4% to $354.2 million in 1982. MAI blamed its lackluster performance on the poor economic conditions and the adverse impact of foreign exchange rate fluctuations. While other heartier companies were able to weather these storms, MAI found the going rough.

Hardest hit was the Basic Four flagship, which ran aground in 1982. Basic Four minicomputer revenues actually dropped 9.5% to $201.5 million during calendar 1982.

The services scene at MAI was decidedly brighter. Processing services revenues totalled $145.2 million, up almost 23% from calendar 1981. Equipment rentals and other revenue declined 8% during the same period, due primarily to the termination of G-Series products.

To bolster its market base, MAI came out with two new Basic Four systems during 1982. At the high end, the company announced the System 810, which doubled the capacity of its top-of-the-line System 710. This is a new ball game for MAI, which had formerly focused its sights on the lower end of the systems market. At that end, MAI introduced another new product in 1982—the S/10 microcomputer. The desktop system, which sells for under $4,000, functions in a standalone mode or as a terminal that can be hooked to mainframe hosts.

Last year MAI also entered the supplies business, offering assorted accessory items for dp, word processing, and personal computer systems. The company expects the supplies sector to grow between 40% and 50% by 1985.

MAI, which prides itself on its maintenance muscle, embellished that image further in 1982 by announcing the Sorbus Station, a carry-in repair service that boasts a 24-hour turnaround time. The centers will provide repair service and supplies for various small computers, printers, and crt terminals.

During the year, MAI was the target of a takeover attempt by Continental Telecom of Atlanta, which purchased almost 15% of MAI's outstanding stock. MAI directors informed Continental that the proposed acquisition would not meet with their approval, and after much negotiating a sell-back was arranged. MAI must pay Continental some $22 million to buy back its shares, while Continental promised not to purchase any more stock for three years. Angry shareholders resented the deal, which gives Continental a hefty profit, because a good portion of those shares were purchased at a low of $8.875, while the sell-back price is close to $17. The shareholders are suing to prevent the sale, and this battle could rage on in the courts for quite some time.

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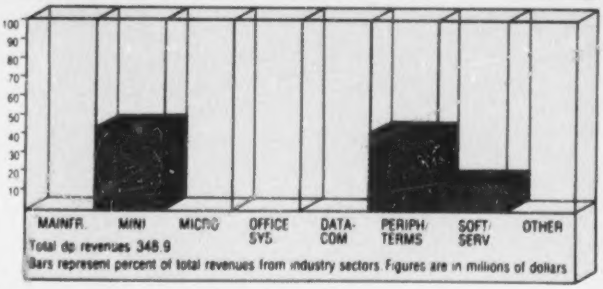

MOHAWK DATA SCIENCES

Seven Century Drive
Parsippany, NJ 07054
(210) 540-9080

It was one of those years for Mohawk when everything was up except the item that counted most—profits. So what looked like a good year really wasn't.

All parts of dp revenue rose, as did the whole. Mini revenues were up 8.7%, to $149 million from $137 million. Peripherals and terminals revenues increased 11.2%, to $145 million from $130.4 million. Software revenues rose 17.8%, to $54.9 million from $46.6 million. Overall dp revenue rose 11%, to $348.9 million from $314 million. Why, then, with all these pieces in the black, did the whole end up red?

Mohawk was hammered more than most by the prolonged recession, continued high interest rates, and a dollar that was 25% to 35% stronger on average than in 1981. The dollar's increased strength versus the numerous foreign currencies in which Mohawk conducts business overseas hurt the company considerably. With 40% of its business overseas, Mohawk cannot tolerate much fluctuation in currency rates.

Correspondingly, total corporate profits dipped 18.3%, to $13.4 million from $16.4 million. Earnings per share decreased even more, showing a 21.4% drop from $1.22 per share to 96 cents per share.

Despite the negative balance sheet, Mohawk increased its research and development expenditures by 22.8%, spending $20.4 million, compared to $16.6 million the previous year. The number of employees also rose, to 6,000 from 5,200. A third indication of better times ahead was a backlog at the close of 1982 that was 18% greater than at the close of 1981.

In 1982, Mohawk acquired DEK Identification Systems, which produces photo ID cards. Early in 1983, Mohawk Data Sciences-Canada acquired CTS Computer Systems. CTS had sold and serviced the complete line of MDS Qantel business computer systems since 1975. Qantel offers specialized software packages for manufacturers, professional sports teams (11 National Football League teams use the system), shoe retailers, electrical wholesalers, hard goods retailers, and hotels.

To aid users of that system, in May 1982 the company introduced its System 64, a high-performance supermini. The previously existing System 20 Qantel line was enhanced by the Systems 22 and 23, specifically designed for the small business user and for use in communications networks. A System 40 line was also unveiled, featuring a new cpu architecture that the company claims allows up to a twofold performance increase over the System 20 series. The high-end System 64 has the capability to process data in 64,000-byte increments, and offers a performance increase almost four times that of the System 40.

While 1983 may not be easier than 1982, Mohawk management believes it will be better.

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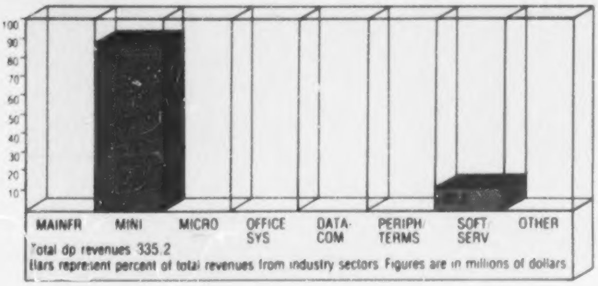

Total dp revenues 335.2
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

TANDEM COMPUTERS INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408) 725-6000

The image of high-flying Tandem Computers took a nose dive last year as it was forced to restate (read "reduce") results for its fiscal year ended Sept. 30. Revenues increased only 40.7% (less than half the year earlier's growth rate) to $335.2 million; profits, however, plunged 2% to $29.1 million from the $29.7 million in calendar '81.

When auditors reviewed Tandem's fiscal year-end statement, they found $23.8 million of reported revenues that they thougnt should not have been recorded as such for the period ended Sept. 30. After much throttling of numbers, Tandem's originally reported results were deflated by 7% in sales and an unsettling 20% in profits.

Last year the company introduced a 2-megabyte memory board for the NonStop II, as well as new peripheral products. The Tandem-designed and manufactured 6530 "ergonomic" terminal, introduced in February '82, showed sufficient market acceptance to stir the company to ramp up production.

Extending its market focus, Tandem bared plans for its comprehensive corporate information system, scheduled for availability this year. The first products are the Transfer information delivery system, Transfer/Mail, and Transfer/FAX. The company also unveiled a fully integrated computer/satellite communications network, called INFOSAT, that will be marketed jointly by Tandem and American Satellite Corp. A new communications product, SNAX, which will provide Tandem users with access to IBM SNA networks, rounded out the year's product announcements.

Tandem opened 12 branch offices in the U.S., Canada, and England. Because about one third of revenues are derived from foreign sales, new sales subsidiaries were set up in Belgium and Norway, and distributors in Argentina and Israel were established. Facilities were further expanded with the opening of new plants in Austin, Texas, and Bensenville, Ill., and an addition to headquarters in Cupertino.

By the end of 1982, analysts were saying the tremors at Tandem were over. After all, the company had taken drastic measures to control expenses and inventories. Known nationally for such employee perks as Friday afternoon "beer bashes," Tandem announced in November that all employees would have a 2½-day unpaid vacation, to be taken prior to Dec. 31. In addition, a series of resignations left president and ceo James G. Treybig as the sole member of the four cofounders still in the cockpit. But Tandem's "fall" is relative only to its year-after-year highfalutin successes. The company still shipped 1,542 processors in fiscal '82, compared with 1,210 the year before. And with a calendar 1982 growth rate of 40.4%, Tandem still flies far above the industry norm.

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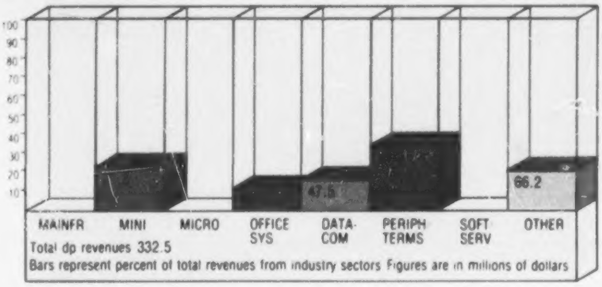

Total dp revenues 332.5
Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

HARRIS CORP.

1025 West NASA Blvd.
Melbourne, FL 32919
(305) 727-9100

Revenues of Harris Corp.'s Information Systems sector, which produces superminicomputers, interactive terminals, distributed data processing systems, word processing systems, digital telephone switches, microprocessor-based telephones, composition equipment, and supervisory control systems, were up 11.8% in 1982 to $332.5 million from $297.4 million in 1981. Internal 1982 sales would add another $17.6 million.

Profits for the sector were down, as were overall corporate profits, which the company attributes to losses in its European marketing operation caused by the recession and a strong dollar and the fact that the previous year's earnings included an after-tax gain of $12.2 million from the sale of the company's investment in Quotron Systems Inc.

Total corporate revenues were up 11% in 1982 to $1.8 billion from $1.6 billion, while corporate profits fell 28% to $66.7 million from $92.6 million. Earnings per share declined to $1.97 from $2.97. Percent of revenues derived from foreign sources declined slightly from 31% in 1981 to 30% in 1982.

In addition to its Information Systems sector, Harris's sales came from its communications, semiconductor, government systems, and printing equipment sectors. In late 1982 it announced it would sell its printing equipment business, with the exception of electronic operations, for $250 million to an investment group. The sale was consummated early this year.

The Information Systems sector in '82 enhanced its top-of-the-line Harris 800 superminicomputer with new operating system software, expanded memory, and new communications options. New software products included X.25 networking, CAD/CAM applications packages, a word processing package, and a fast color graphics capability.

The Harris 9200 interactive terminal system, introduced in 1981, did well in 1982. It can communicate with two host computers simultaneously in either of the two most widely used protocols. With new offerings of a fiber optic communications link, base color support, and a 132-column screen format, it is strongly positioned in the IBM 3270-compatible market.

The Harris 8000 series of terminals continued to enjoy good customer acceptance. Deliveries of custom versions for the Avis Wizard II reservation system and the NASDAQ stock quotation network were completed in 1982.

The company's new Mind series, a distributed data processing system introduced in 1982, offers such features as a tri-level architecture incorporating an interactive processor for host computer communications, a distributed processor for file management, and intelligent, multifunctional workstations for delegating processing power to end users.

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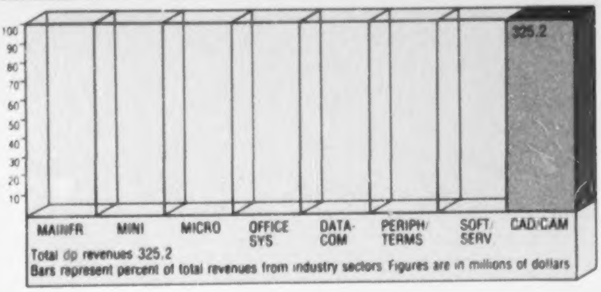

COMPUTERVISION CORP.

201 Burlington Road
Bedford, MA 01730
(617) 275-1800

Increased competition in the CAD/CAM market, recessionary pressures, and what some call an outmoded marketing strategy all spelled calamity for Computervision. For the second straight year, the company's growth rate was sliced in half. Following explosive revenue growth of 85.5% in 1980, the company's revenues rose only 41.7% in 1981, and by year-end 1982 the revenues increase was down to 20%. Meanwhile, '82 earnings were up a mere 2%. The market share leader in CAD/CAM systems closed its books on 1982 with earnings of $32.4 million on sales of $325.2 million. Comparable figures for 1981 were $31.8 million in earnings and $270.[illegible] million in sales. Per-share earnings for '82 dropped 9.3% to $1.18 from $1.30.

Computervision points out that contributing to the low return on sales were high spending rates for marketing activities and for R&D (which jumped 33% last year to $36.3 million), lower gross margins resulting from a higher proportion of sales to the federal government, capacity-related manufacturing variances, and of course the economic woes.

Unlike its competitors—such as Calma, Intergraph, and Auto-trol, which concentrate on developing the software and buy other vendors' hardware—Computervision insists on sticking with its vertically integrated posture. Despite analysts' admonishments, the company is determined to manufacture all its own hardware and software, as well as do its own training and servicing. Nonetheless, some of the more nimble vendors appear to be beating the company at its own game. Intergraph, for instance, beat Computervision to the 32-bit punch by aggressively marketing its new CAD/CAM software on a DEC 32-bit processor. Meanwhile, the Massachusetts-based granddaddy of the CAD/CAM market missed the boat on the 32-bit business last year, announcing in the third quarter that introduction of its 32-bit challenger had again been postponed, this time until 1983. (It had been announced a year earlier.)

The company claims its earnings slowdown is not the product of the delayed 32-bit processor introduction, but rather of the economic nightmare—"the fact that most of our customers are in smokestack America, and smokestack America isn't doing too well right now," as company spokesman R. James Carr commented. The company did begin shipments of its new Instaview HC, a high-resolution, color interactive graphics workstation, and early orders showed promise.

Last fall Computervision made a major management change when it named James R. Berrett, formerly a Honeywell Inc. group vp, to succeed Martin Allen as president and ceo. Allen, who remains chairman, now devotes his time to strategic planning. Berrett wasn't the only new person to be brought on board last year; Computervision upped its total work force by 8.7% to end the year at 4,130 strong.

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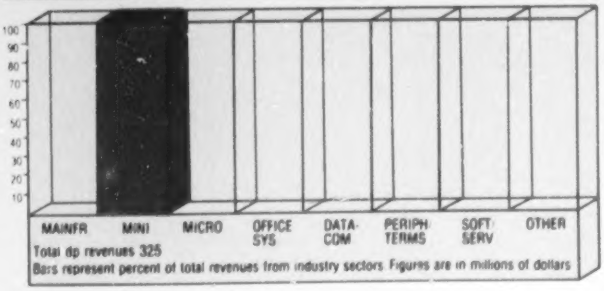

GOULD INC.

10 Gould Center
Rolling Meadows, IL 60008
(312) 640-4000

William Ylvisaker, Gould chairman and chief executive, last year continued his relentless drive to convert the poky circuit breaker company of the 1970s into a fast-growing electonics powerhouse. The February 1982 acquisition of custom chipmaker American Microsystems Inc. and planned divestiture of the rest of its electrical products business just about completed the worm-into-butterfly metamorphosis, yet Gould's new look did not translate into healthy growth last year—corporate revenues were only up 5.3% to $1.6 billion.

Data processing revenues did advance 20% to $325 million, as the high-performance 32-bit minicomputers from the SEL division of Ft. Lauderdale, Fla., which was acquired in 1980, continued in demand as the cpus for flight simulators and other heavy-duty number-crunching tasks. DATAMATION estimates a 25% increase in SEL revenues, to $162 million, from the 1981 level. Because of the recession and the resulting downturn in digital spending, Gould's Modicon division suffered. The programmable logic controllers, which are basically dedicated minis in a hardened enclosure suitable for factory locations—such as lathe and punch press controllers—were particularly hard hit. These products experienced a growth rate of 16%, which is about the half the growth rate of the previous few years.

Line extensions up and down the performance curve gave SEL expanded coverage in the superminicomputer market. The new big machine, the 32/8780 model introduced last June, features a 3.7 million instructions-per-second speed using ECL chips. To meet the board-level supermini competition, SEL announced Quadrabyte, consisting of a cpu, I/O, and 512KB of memory, for the oem markets at under $14,000.

Gould's overall earnings growth was as lackluster as the revenue advance. Total corporate net income from continuing operations, $90.5 million, was a bare 3.5% above 1981 level. The wave of acquisitions pushed interest expense to $31.7 million, but research and development outlays increased 27% to $154 million, or approximately 10% of sales.

Like other dp equipment vendors, Gould reported a weak second half of 1982 but saw a rising order trend late in the year. To smooth the consolidation of the once disparate parts of the company and profit from the strengthening economy, a new decentralized organizational structure was adopted early in 1983. If the parts mesh into a strong unit ready to profit from new opportunities like factory automation, Gould may yet deliver the kind of profits and high-technology image that Ylvisaker craves.

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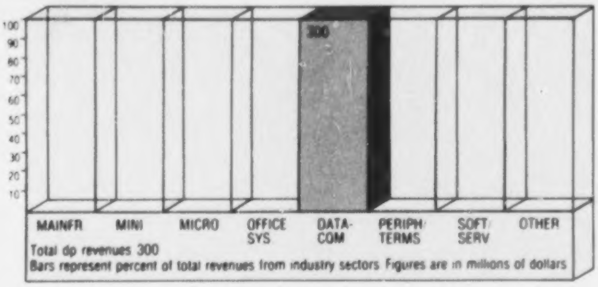

RACAL DATA COMMUNICATIONS INC.

8600 N.W. 41st Street
Miami, FL 33166
(305) 592-8600

Modems are big business these days, and nobody is bigger in the booming modem business than Racal-Milgo and Racal-Vadic, the American branches of the British company Racal Electronics. Vadic and Milgo, managed separately but with combined headquarters in Miami, together grossed about $300 million last year from their lines of modems, signal processors, terminals, and other peripherals.

Vadic is the number one manufacturer of low-speed, low-cost modems, while Milgo concentrates on higher speed and more sophisticated peripherals such as data encryption devices. As the modem market continued its 35% per year growth rate, Racal's subsidiaries emphasized new product and marketing efforts to retain the ranking.

Vadic's small oem modem business received a shot in the arm with the introduction of the new VS212P modem card in July. Bell 212A/103J compatible, the $420 PC board includes a microprocessor and custom LSI chips for digital to analog or analog to digital conversion at 0-300bps or 1200bps. A memory dialer feature is an option. Racal predicts that oem sales will exceed commercial standalone sales in a few years.

Vadic also packages the micro and signal chips of the VS212P as a standalone modem. For $550, the VA212C includes automatic answering and a manual override. Five LEDs display self-test and operation status. An automatic detection algorithm distinguishes between 9- or 10-bit ASCII code.

Milgo, the larger of the two companies, with $200 million in fiscal 1982 revenues, announced its entry in the local area network sweepstakes in November. A baseband system modeled on the token ring passing scheme promoted by IBM, the Planet system can link up to 500 devices using 250 special termination interfaces. Data speeds of up to 19,200bps can be made in either synchronous, asynchronous, or bisynchronous modes.

A new series of high-performance 4800bps modems, the Omnimode, was introduced in September. Internal hardware straps are eliminated with a new front display panel for software-based alterations. Special circuitry permits international data transfers. A master and slave program arrangement among multiple Omnimodes is also available. Custom LSI chip design features include multiple operating speeds for up to four ports per modem—one port can operate at 2400bps while two others can receive or transmit at 1200bps.

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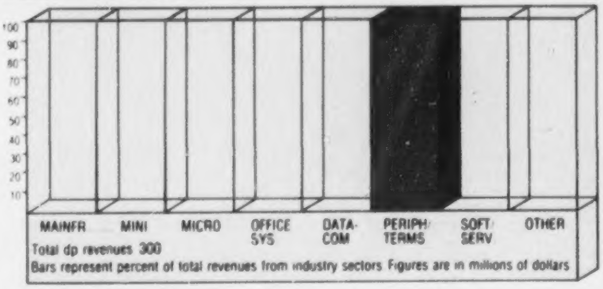

TEKTRONIX INC.

4900 S.W. Griffith Drive
Beaverton, OR 97077
(503) 644-0161

A sagging economy, soaring manufacturing costs, and an internal reorganization left Tektronix looking for brighter days in '83. Last year's earnings were off for the second straight year, declining 11.7% to $71.1 million. (Tektronix's fiscal year ended Nov. 31, and those are the numbers used for this survey.) Though the oscilloscope giant's total sales grew almost 10% to some $1.2 billion, its dp-related revenues declined 2.9% to $300 million from 1981.

Dp revenues were generated by the company's Information Display group, with over half coming from computer graphics terminals and displays and the remainder from graphics-based engineering desktop computers and hardcopy devices such as copiers, plotters, and image-making products.

The ID group's results last year were bolstered by the introduction of Tektronix's new 4110 series of graphic computer terminals—monochrome and color. The star performer was the 4113 color raster terminal, a sharp break from the firm's traditional storage tube devices but a product that is compatible with them. The company also offers two copiers in support of this line—the 4611 (with storage tube devices) and the 4612 electrostatic copier (with the color raster terminals). November brought the announcement of the company's first color copier, the 4691 color hardcopy device, which uses ink jet technology.

New products were the good news and escalating manufacturing costs the bad, with those expenses accounting for about 50% of the company's cost of sales. As in 1981, the result was depressed margins.

Tektronix's solution to this problem is to switch from a functionally oriented organization to one that is more product- and market-specific. The former functional structures are now being integrated into a new divisional framework so that the divisional managers can gain control of, and accountability for, all aspects of their business.

In another cost-cutting measure, the company has opted to shed some employees. During 1982 it reduced its work force by 607 people to end the year at 22,924.

Once the new divisional structure begins to jell and the economy in general shows signs of an upturn, the Information Display group might get back in the groove of its former growth track. The focus of any new products can be expected to remain the same—for scientific/engineering uses, especially in CAD/CAM.

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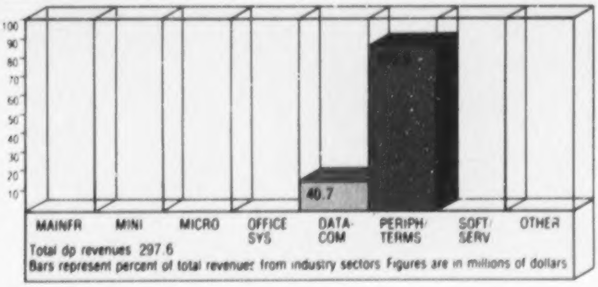

DATAPRODUCTS CORP.

6200 Canoga Avenue
Woodland Hills, CA 91365
(213) 887-8000

Dataproducts spent most of 1981 gearing up to meet demand that never came, but its 20th anniversary year provided the beginnings of a turnaround. Net sales rose 10.2% to $297.6 million, compared to 1981's zero growth. Total profits were up to $10.8 million, a 4.8% increase for the calendar year. On the brighter side, the stock rose a hefty 72.5% to end the year at 36.

Dataproducts' business splits basically into two streams: dp products and data communications equipment. Last year, oems accounted for 90% of the company's output, and Dataproducts is generally recognized as the leading supplier of medium- and high-speed line printers to this sector. Recently, the company has begun producing dot matrix and daisywheel printers.

The company's datacom products embrace network management and control systems, as well as digital communications transmission equipment. These products are sold primarily to the U.S. government and thus are more recession resistant. This proved true last year, with datacom equipment growing 15% to $40.7 million, while dp products only grew 9.5%.

Dataproducts also had a declining core memory business, which was facing increasing competition from semiconductor manufacturers. This was sold to Three Delta Corp., Sunnyvale, Calif., in the fall for an undisclosed price. Soon after this sale became effective, the company announced it had agreed in principle to buy the matrix printer manufacturer Integral Systems for 900,000 shares of Dataproducts stock.

The company was busy in the new product area too, announcing a completely new family of daisywheel printers. From this "second generation" the company unveiled the DP-35, a 35-character/second letter quality device; and a larger 55-cps equivalent, the DP-55. Both machines feature very low noise levels (62 decibels) in standard cabinets.

Other product highlights during the year included enhancements and modifications to the company's M-series matrix printers, and a high-end replacement for the company's 1,800 lines/minute band printer, the BP-1800, which now offers 2,000 lpm. As expected, the company moved to phase out its remaining 2200 series drum printers, now that customers have switched their preference to higher-performance band printers.

Several major new contracts were announced in calendar '82, including deals with Tandem, Prime, and Vector Graphic. In a burst of anniversary spirit, Dataproducts offered clients new lifetime warranties for matrix heads—an industry first.

One other item of note from a lively year was the completion in Dublin, Ireland, of a new 217,000-sq.-ft. manufacturing facility, which will supply the European market with line printers and could conceivably boost the company's overseas presence, which in 1982 accounted for 20% of net sales.

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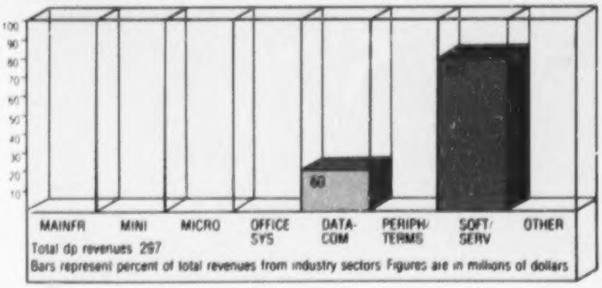

TYMSHARE INC.

20705 Valley Green Drive
Cupertino, CA 95014
(408) 446-6000

Tymshare boosted its revenues a modest 2.5% in 1982 to $297.0 million from $289.7 million, while its income plunged 44% from $15.7 million to $8.8 million. Per-share earnings went from $1.33 to 73 cents.

The 17-year-old data processing and telecommunications services firm trimmed its work force in '82 to 3,600 from 3,975 but upped its research and development expenditures from $16 million to $17.5 million. Tymshare in '82 was one of four companies authorized by the FCC to offer metropolitan networks for high-speed digital communications, a situation that some analysts see as boding well for the company's future while others worry about the threat of such formidable competitors as Citicorp, IBM, and AT&T.

Tymshare cut some losses in 1982 by selling off unprofitable credit card processing and medical systems businesses and backing off on a less than successful entry into the automated teller market.

The most significant event for Tymshare in 1982 had nothing to do with its products or even the marketplace. Tymshare in one fell swoop managed to get the entire Wall Street community very annoyed. In the process it cost Tymshare stockholders some $70 million in paper losses from which the stock has yet to recover. The problem occurred in November, when Tymshare announced its third-quarter figures. The company reported that it earned 19 cents a share, all of which had come from the sale of a subsidiary. This type of information is usually footnoted on the financial statement, but Tymshare merely put that announcement in the text of the news release. As the bad news spread that the company made no money from continuing operations, near panic ensued, and the stock took a beating. This error will have long-term effects as the company strives to regain the confidence of security analysts and investors, none of whom take kindly to being tricked. At year-end the stock had slumped to 18, down 37% for the year.

Many analysts continue to regard Tymshare's Tymnet network as a technological leader in data communications, and the company continues to offer enhancements to services it provides via the network.

In the hardware arena, an offering in late 1982 was the Scanset XL, priced at $895 and billed as a personal information terminal with a built-in telephone. Manufactured to Tymshare's specifications by the French telecommunications company Matra, it is the latest in a line of personal terminals the company began to introduce early in the year.

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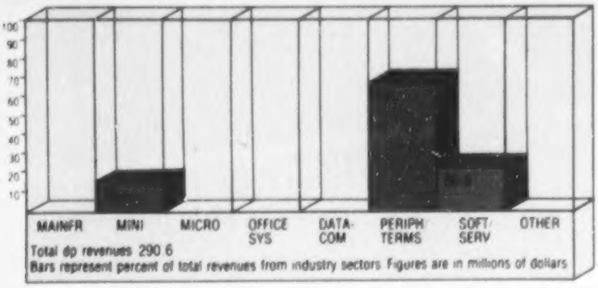

C. ITOH ELECTRONICS INC.

5301 Beethoven Street
Los Angeles, CA 90066
(213) 306-6700

Hardly a household word a few years ago, the name C. Itoh & Co., the Tokyo-based trading company, appeared in a sizable number of American homes and offices last year. The F-10 daisywheel printer bearing the Itoh label became a familiar sight in personal computer stores, sharing shelf space with peripherals from other Japanese firms making inroads into the PC market. Strong volume shipments of the F-10, the Prowriter dot matrix printer, and other gear led to a 45% increase in peripheral and terminal revenues to $192 million for C. Itoh's American subsidiary, C. Itoh Electronics Inc.

As a trading company, C. Itoh Elecronics imports devices made by other companies in Japan; the letter quality printer is made by Tokyo Electric. Overall 1982 dp revenues for the American subsidiary were $290 million, up 36% from the prior year. The company also recorded a 20% revenue surge in its minicomputer and software lines.

C. Itoh Electronics is a mere drop of sake compared to its Japanese parent, C. Itoh & Co. Ltd. One of the largest companies in Japan, C. Itoh's transaction trading total of $51.5 billion in the 1982 fiscal year that ended March 31, 1982 was roughly 50% larger than the total revenues for International Business Machines Corp. Most of C. Itoh's worldwide revenues come from making or trading basic materials such as ore, grains, and textiles as well as manufactured products such as machinery. Electronics is a small but growing part of the company, which does business through 403 subsidiaries in 81 countries around the world.

Electronics from C. Itoh come from three different operations. C. Itoh Terminals sells video display terminals and recently introduced a new line printer. CIE Systems announced a small business computer system last year based on the Motorola 68000 microprocessor. The daisywheel and dot matrix printers are from C. Itoh Electronics. Oem items such as crts are also part of the CIE product line.

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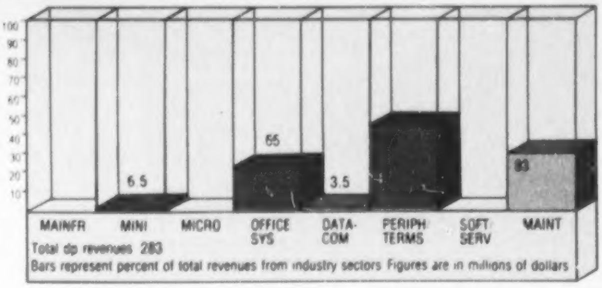

RAYTHEON COMPANY

141 Spring Street
Lexington, MA 02173
(617) 862-6600

Raytheon's roots are in the electronics business. Last year more than half of this diversified Fortune 100 industrialist's $5.5 billion in revenues grew out of sales of electronics products; two thirds of its pretax income was drawn from this same business area. Within this mammoth electronics group sits Raytheon Data Systems, the company's small dp revenues producer. Even though RDS represents but a small plot in the vast corporate acreage, its 1982 growth rate surpassed that of its parent.

Hard hit by the economic drought, total corporate sales shrank 2.2% from the 1981 level of $5.6 billion. Profits dried up even more, as indicated by the company's net income drop to $318.8 million in '82 from $324 million in '81. But sitting in greener pastures in nearby Norwood, Mass., Raytheon Data Systems saw sales climb 9.6% to $283 million from the year earlier's $258 million. Contributing to that healthier harvest was a 25% increase to $125 million in sales of terminals and a 31.7% growth to $83 million in maintenance and repair revenues. The company brought in $65 million from office systems revenues, and another $3.5 million from the data communications field. Although the minicomputer growth rate was stunted compared to the prior year, that area contributed another $6.5 million to the total. By year-end RDS was working with 400 fewer helping hands, as employment dwindled during the year to 4,200. Meanwhile, parent Raytheon had to let 4,500 people go, leaving it with 72,000 to tend the crops.

Times might have been tougher were it not for the fact that 39% of total corporate sales were to the U.S. government. Raytheon Data Systems had its share of that business as well. As part of the Army's Vertical Installation Automation Baseline Equipment (VIABLE) program, RDS will supply 18,000 terminals and printers to 47 U.S. Army posts. Raytheon is a subcontractor to Electronic Data Systems Corp. for the 10-year program.

New to Raytheon Data Systems' wares in 1982 was the RDS-200 word processor. In addition to word processing, the system performs business or engineering computations, and serves as a personal computer when used with standard software packages also being offered by Raytheon. Not to ignore its mainstay, the company enhanced the IBM-compatible PTS-2000 data terminal product line last year to further extend its performance. And with an eye on '83, RDS said it made major progress during the past year in developing a family of multifunction terminal systems that will debut this year.

Signaling the corporation's commitment to advanced microcircuits, Raytheon began construction on an 80,000-square-foot facility at Andover, Mass., for the design, development, and production of integrated circuits at the 1 micron level.

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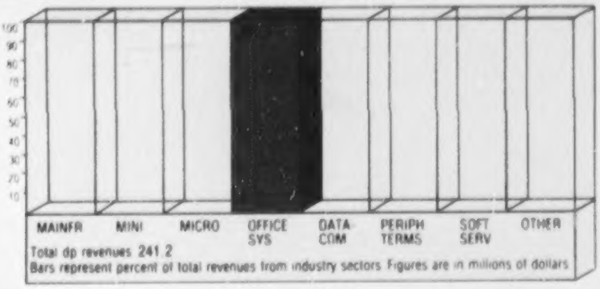

LANIER BUSINESS PRODUCTS INC.

1700 Chantilly Drive N.E.
Atlanta, GA 30324
(404) 329-8000

After five straight years of soaring profits, this office products specialist came back down to earth with a bang in calendar '82. Net income declined 11.4% to $22.6 million on the back of a moderate sales growth.

The company's three product divisions combined achieved total sales of $365.4 million—just over 12% on last year. A surge in field service revenues, however, had more to do with the revenues increase than any growth in demand for the eight major products that the company unveiled late in 1981.

DATAMATION estimates Lanier had $241.2 million in sales from its video display word processors and small business computers, representing a growth of only 5.7%.

Lanier attributed its moderate showing to delays in shipping its eight major new products. The company also cited the uncertain economic outlook as a contributing factor to its decline in growth rate. Despite all this, the company spent last year preparing the ground for an upswing through what it called its "year of investing in the future." Fiscal 1982 R&D revenue grew sharply to $8.1 million from $4.6 million, and throughout the year Lanier pushed on with a series of new software capabilites and product features for the new systems.

To its new Computereze small business computer, the company added word processing, CP/M, and Data Manager. Lanier's equally user-friendly EZ-1 video display word processor was adorned with three data communications options—3270/SNA, 3780, and tty/ASCII—as well as more general enhancements such as a shared printer option, Data Manager, CP/M, Business BASIC, EZ-Spell, and Full Math.

Lanier also announced enhancements to its Super No Problem typing system, including CP/M, Microsoft BASIC, and new advanced word processing features.

Lanier's "investment in the future" also resulted in the purchase of the Ramada Inn Central in Atlanta, which this year has been converted into a major sales, service, and market support operation.

Other future-directed moves, aimed at competitors such as Wang, Xerox, and IBM, included a 50% increase in manufacturing capacity at the company's Thomaston, Ga., plant.

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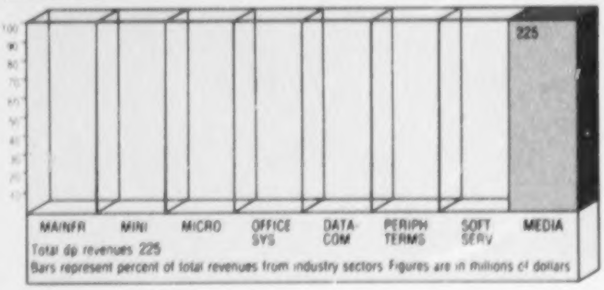

3M

3M Center
St. Paul, MN 55144
(612) 733-1110

From a company with a single product line, sandpaper, 3M has grown over the decades into a company that is among the most diverse in the world. The company restructured its operations in 1981 into four sectors—industrial and consumer, graphic technologies, life sciences, and electronic and information technologies.

The Electronic and Information Technologies Sector, with 1982 sales up only slightly to $2.02 billion from $1.99 billion in 1981, participates in three high-tech businesses—electrical, electronics, and telecommunications; office information; and magnetic and optical recording. While the company does not separate dp-related revenues from that group, DATAMATION estimates that such sales remained constant at the 1981 level of $225 million.

As a whole, 3M did not have one of its better years in 1982. Total corporate sales inched up only 1.4% to $6.6 billion from the year earlier's $6.5 billion. Corporate profits declined 6.3% to $631 million ($5.37 per share) from $673 million ($5.74 per share) in 1981. Helping to cushion the blows to the bottom line last year was a significant reduction in worldwide employment, which fell by approximately 4,000 employees to 87,388 at year-end. A major portion of the decline occurred in the U.S. and was due to attrition and to a voluntary early retirement program. While the effects of flat sales were felt in the dp sector as well, the company paved the way for improved results in 1983.

Last year 3M introduced two digital facsimile transceivers, upping its stature in the market for electronic document communications. The company expects its position to be further strengthened this year through the introduction of its Whisper Exchange. This system is a network of teleprinters that send and receive messages over phone lines under computer control.

Future prospects of 3M are also favorable in supplying magnetic storage media to the computer industry. The company is currently focusing on two major segments of the media market—flexible disks and data cartridge systems. Late last year 3M was selected by Apple Computer to develop a new generation of floppy disks offering a sixfold increase in storage capacity. In the fast-growing market for data cartridge systems, 3M's HCD-75 increases by nearly 50 times the amount of information that can be stored on a 4 by 6-inch cartridge. The system initially is being used in various Hewlett-Packard computers.

To meet future needs of the computer industry, 3M is working to develop new thin-film magnetic media, offering the potential for even greater increases in data storage capacities. Advanced optical technologies under development are said to offer high-capacity direct-read-after-write capabilities, with considerable potential for new generations of computer equipment.

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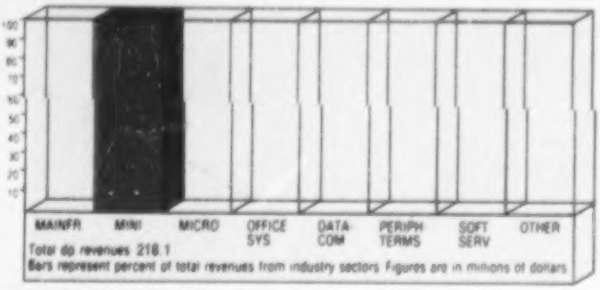

Total dp revenues 218.1

Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

PERKIN-ELMER CORP.

Main Avenue
Norwalk, Ct 06856
(203) 762-1000

While Perkin-Elmer's corporate picture grew darker in 1982, its Data Systems Group of Oceanport, N.J., managed to come out of the year better than it went in. The corporation, a leading manufacturer of electronic analytical instruments, semiconductor production machines, and minicomputer systems, saw revenues drop 8% to $1.01 billion and earnings tumble 34% to $51.3 million, an operating margin of only 5%. The Data Systems Group, by comparison, had a strong year, with revenues climbing 17% to $218.1 million. (Figures for both years exclude the Memory Products Division, which was sold to Cipher Data Products.)

The Data Systems Group currently consists of the Business Systems Division, founded in 1981, and the Technical Systems Division, which dates from Perkin-Elmer's acquisition of Interdata a decade ago. The basic product within both divisions is the 3200 series of minicomputers, which run Unix or a proprietary operating system. Business systems based on the 3200 series run the Reliance transaction processing software.

The company introduced several new products in 1982. In July, the Intelligent Disc Controller was brought out to provide a high-performance interface between the 3200 Megaminis and their high-speed disk storage products. (When the old Memory Products Division was sold, the reason cited was that the products were not fast enough; the IDC is their replacement.) Later in July, the Data Systems Group introduced RQL/32, a relational query language for the Reliance software.

In August, a shared memory system was introduced; based on a multibank structure, it allowed users to combine uniprocessor 3200s into multiprocessor systems for applications requiring fault tolerance or very high throughput. And in November, the 3200 MPS was announced. The 3200 MPS is simply Perkin-Elmer's idea of how to use the shared memory system to create a multiprocessing superminicomputer.

In early 1983, the company continued with its spate of new products, introducing a supermini based on the Edition VII Workbench implementation of Unix in January and the PENnet X.25 compatible network in March.

Part of the reason behind the corporation's decline in 1982 was a lackluster performance by the Semiconductor Division. P-E signed an agreement with Censor to sell and service its step-and-repeat aligner for semiconductor wafer fabrication. The product is a direct competitor of Perkin-Elmer's own semiconductor product, the Micraligner projection aligner; P-E's management has pretty much conceded that this product is verging on obsolescence and that as a result, "the semiconductor division is unlikely ever again to attain its previous high margin levels."

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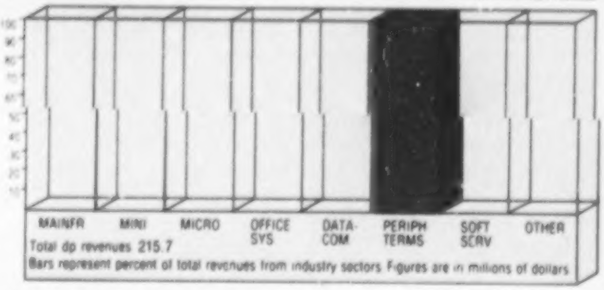

Total dp revenues 215.7

Bars represent percent of total revenues from industry sectors. Figures are in millions of dollars

SANDERS ASSOCIATES INC.

Daniel Webster Highway South
Nashua, NH 03061
(603) 885-4321

Sanders Associates Inc. had a successful 1982. DATAMATION estimates that corporate revenues rose 19%, to $487.8 million from $408.7 million. Corporate profits showed a 23% gain, to $29.5 million from $23.9 million. The growth came in both Government Systems and Products—the company's name for its activities in electronic countermeasures and warfare systems—and in dp sales.

Sanders's dp activities come under the heading of Graphic Systems and Products. This part of the company, we estimate, saw revenues increase 40%, to $215.7 million from $153.9 million. Profits, however, don't appear to have kept pace. The company's annual report shows operating income for this division down 30% for the fiscal year ending July 30. The increase in revenues was good enough to move Sanders from number 49 up to number 46 in the DATAMATION 100.

Sanders's Graphic Systems and Products business includes five product areas: digital plotters, graphic displays, graphic systems for command and control, digitizers, and turnkey CAD systems. The company bought its way into most of these fields with the 1980 acquisition of Calcomp, which has been reorganized since it has been combined with the parent company.

In digital plotters, the company claims strong sales of its model 5500 electrostatic plotter/printer and 95X family of vector-to-raster controllers. There was also a new product, a mobile, rack-mounted electrostatic plotter/printer.

In graphic displays, Sanders received a $36 million order for continued manufacture of IBM's 3250 graphic display terminal. (IBM placed another order for 3250s, worth "as much as $38.7 million" in early 1983.) Sanders also says there was "strong demand" for its Vistagraphic 4000 line of intelligent graphics display terminals, which are targeted at oems.

CalComp's digitizer business was expanded by the introduction of the 9000 series, which was adopted by "several major oems," including Synercom and Camsco. The digitizers are used in turnkey CAD systems.

CalComp's own turnkey CAD systems are designed for the architecture, construction, and engineering industries. The company's basic interactive graphics system (IGS) got a couple of new bells and whistles in the course of the year: a color interactive graphics workstation and an enhanced cpu. There was also new software: an application package that automates equipment layout and inventory management and keeps track of wiring, piping, and air ducts.

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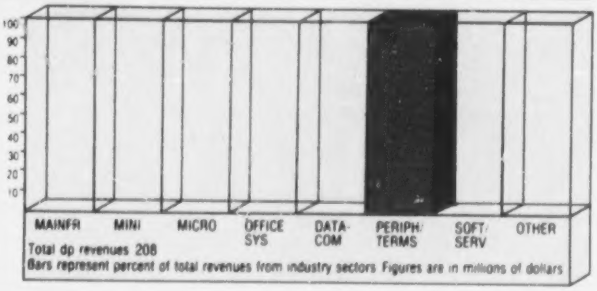

Total dp revenues 208

Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

ANACONDA-ERICSSON INC.

7465 Lampson
P.O. Box 938
Garden Grove, CA 92642
(714) 895-3962

The offspring of a joint venture between the Swedish communications manufacturer LM Ericsson Telephone Co. and Atlantic Richfield's Anaconda subsidiary, Anaconda-Ericsson Inc. sells transmission and switching equipment and a growing number of office automation products.

The company was set up in 1980 as a means for Ericsson to further its interests in the U.S. market, where Anaconda had had fair success in selling cabling and related equipment to the telephone interconnect market. Through the 1981 acquisition of Axxa Corp. from Citicorp and the development of certain data processing equipment in Sweden, however, the company is attempting to become a recognized force in the office automation markets. Axxa was set up by Citicorp to develop and sell executive workstations, but the bank holding company ran afoul of banking regulations and was forced to sell its only product, the Axxa workstation.

The product has found a poor reception since it was delayed in coming to market and was far overpriced compared to competitive machines. It is estimated that only about 200 of the workstations have been installed so far, most of them at Citicorp itself.

The company is understood to be working on further enhancements to the Axxa technology, which combines word processing, data processing, and data communications in a single desktop unit. New products are expected to work closely with the firm's MD 110 digital PBX, which was introduced in the U.S. in early May. The MD 110, already available in Sweden, will be the basis for voice and data communications in offices.

For this survey, Anaconda-Ericsson's PBX business, which totaled $286 million in 1982, was excluded because the systems being sold previous to the MD 110 are analog. The firm's bank terminal sales, however, under the name Datasaab, are included.

LM Ericsson also plans to bring to U.S. shores in the near future a line of 3270-type computer terminals and cellular radio equipment that has already gained a good reputation and won the company major U.S. investments in its recently issued shares sold in the U.S. Cellular radio is expected to be a major growth area for the firm in coming years as it is applied to mobile telephone systems.

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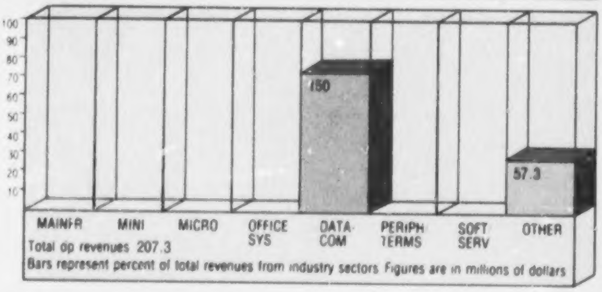


Total dp revenues 207.3

Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

PARADYNE CORP.

8550 Ullmerton Road
Largo, FL 33540
(813) 530-2000

The year 1982 was one of Paradyne's finest. The data communications equipment company was flying high with record revenues, profits, and earnings per share. The good vibes were apparent on Wall Street, where Paradyne stock had become a star attraction.

Then came the Securities and Exchange Commission (SEC), alleging this March in a lawsuit that Paradyne had used fraud and deceit to win its March 1981 $100 million contract with the Social Security Administration (SSA). The SEC contended that Paradyne won the contract by putting its P-8400 brand name on a Digital Equipment Corp. (DEC) PDP-11/03 and by making an information-encoding machine that was "nothing more than an empty box with blinking lights."

Paradyne crashed immediately to earth, faster than any satellite. The thud was also heard on Wall Street, where in one day the stock lost 20% of its value and trading had to be suspended.

Forgotten quickly were the 49.1% increase in 1982 corporate revenues to $207.3 million, the 47% rise in profits to $26.9 million, and the 33.3% jump in earnings per share to $1.24. Shunted aside were Paradyne's proud statements that the SSA contract was "one of the key efforts of 1981" and "a major step in the company's ability to undertake large system contracts." The contract, calling for the installation of 2,000 to 3,000 intelligent terminals over eight years, was the largest ever awarded by the SSA and the largest ever won by Paradyne.

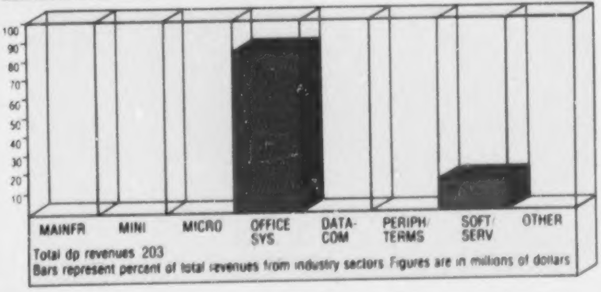
The situation grew bleaker for Paradyne. Because the contract was fraudulently obtained, according to the SEC, the company's financial statements to the SEC and to its shareholders since March 1981 have been "deceptive and misleading." So much for all those records in 1982, the SEC implies. An owner of 200 shares of Paradyne stock filed a class action lawsuit charging Paradyne and its top officers with conspiring to defraud the investing public by artificially inflating the price of its common stock. The suit also names the lead underwriter for the four offerings of Paradyne stock since the SSA contract award.

Only SSA officials remained in Paradyne's corner, defending their decision and indicating they might even exercise an option to buy additional equipment from the company.

Paradyne's only comments throughout the affair were that the charges were "without merit" and the company intends "vigorously to contest the allegations in court."

Wall Street, along with the entire computer industry, will be listening anxiously.

49



Total dp revenues 203
Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

PHILIPS INFORMATION SYSTEMS INC.

4040 McEwen Avenue
Dallas, TX 75234
(214) 386-5580

Philips joined the Top 100 back in 1980 with the rank of 98, but in just two years it has cut that number in half. Revenues have grown from $68 million in 1980 to $203 million in 1982 for this word processing and office automation specialist.

Philips was formed back in 1979 when president and founder Steven Dorsey formed a partnership with Philips NV of the Netherlands to utilize the name, capital, distribution network, and R&D resources of the Dutch electronics firms. In 1981, Micom in the United States adopted the Philips name, but the Canadian operation kept the Micom name.

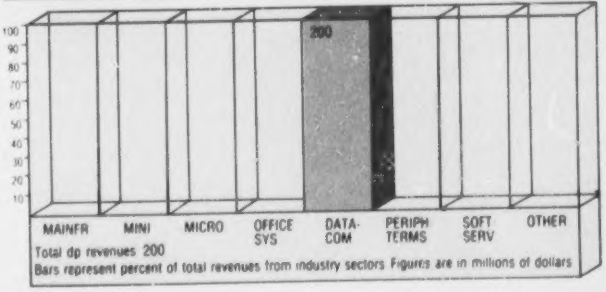
Since Philips is owned by the giant (1982 sales of $15 billion) electronics company, individual division profits aren't available. It is interesting to note, however, that the parent is experiencing problems with its office automation products, and states in the annual report that the worldwide growth rate of these products declined during 1982.

There was no decline reported from Dallas, however. Revenues for the word processing equipment grew 43% to $176 million. The bulk of these sales came from the model 2002 and 3003 families. The 2002 is a minimal dual crt system with a 128K byte processor and is expandable to a four-station system and programmable to handle dp functions. During 1982, this was expanded to handle eight stations: four terminals and four screens.

The model 3003, a standalone word processing system with graphics capabilities, was also upgraded during 1982. The model 3004, an integrated desktop multifunction word processor and personal computer with communication capabilities, was also announced. To capture more of this market, Philips announced this spring that the model 3003 would go on sale during a special two-month promotion. The price was dropped from $8,900 to $5,900.

By early 1983 the company began shipping its Information Facility, which is a store-and-forward message center or electronic mail system. This was met with enthusiasm by customers.

50



Total dp revenues 200
Bars represent percent of total revenues from industry sectors Figures are in millions of dollars

M/A-COM INC.

South Avenue
Burlington, MA 01803
(617) 272-9600

For a company that became a stock market favorite by increasing profit an average of 50% annually for five years running, M/A-Com encountered its first blip in a long time last year. Calendar year earnings were down 27.2% to $30.8 million from the year earlier's $42.3 million, and revenues increased only 17.8% to $610.9 million, up from $518.7 million in 1981.

The picture looks brighter, however, when only dp-related revenue is examined, all of which is generated by datacom gear sold through the company's Integrated Digital Communications Group. Here, DATAMATION estimates sales climbed 43% to $200 million from the $140 million recorded for calendar year 1981. At its Oct. 2 fiscal year-end, M/A-Com reported that IDC's operating margin declined during the year to 10.3% from 12.4% in '81, resulting primarily from R&D expenditures that soared to $12.3 million in fiscal '82 compared with $4.3 million in fiscal '81. The 1982 number represented 54% of the total corporate-sponsored R&D.

The IDC group began to see its R&D efforts in digital termination systems equipment pay off last year as orders started rolling in from carriers both in the U.S. and overseas. Still the leading supplier of packet switching gear for both commercial and government applications, M/A-Com IDC entered into a joint marketing agreement during 1982 with the Large Computer Group of Digital Equipment Corp. to distribute the IDX-3000 data switch for local communications networks. IDC makes other datacom products such as modems, multiplexors, network controllers, circuit switches, and local area networks.

While the IDC group got a new president in Dr. Irwin Mark Jacobs last year, the biggest change in M/A-Com's management was made at the very top. At midyear Richard T. DiBona, the firm's 49-year-old president, was elected to the additional post of ceo, succeeding company founder Dr. Lawrence Gould, who remains chairman in name and strategic consultant in responsibilities. A scientist interested in technological development, Gould is largely responsible for moving the company from its early days as Microwave Associates Inc. into the mini-conglomerate communications company by melding some 20 seemingly diverse companies into a well-rounded concern.

With M/A-Com's stock starting the year at 25¼ and dropping to 23⅛ by Dec. 31, analysts began speculating that the changes in top management signaled a shift in emphasis to marketing and away from technological development. While fiscal '82 R&D expenditures would seem to contradict that notion, as they increased 56% over fiscal '81 to $23 million, DiBona has indicated that FY '83 will see only a "modest increase" in that category.

51

TELEX CORPORATION

6422 E. 41st Street
Tulsa, OK 74135
(918) 627-1111

Terminal-maker Telex enjoyed a good year in 1982, as revenues and earnings reached new record levels. Total sales increased 27.7% to $256.1 million from the year earlier's $200.4 million. While earnings were up an astonishing 119.6% to $24.6 million from $11.2 million the prior year, the 1982 number includes $4.14 million in extraordinary credits.

Telex's dp revenues growth rate was also impressive, climbing 36.4% to $194.7 million from the 1981 total of $142.7 million. Most of these dp revenues come from peripheral product sales out of Telex Computer Products Inc. (TCP), headquartered, along with the parent organization, in Tulsa. In addition to three facilities in Tulsa, TCP has manufacturing facilities in Raleigh, N.C., and Addison, Texas.

TCP's healthy 1982 performance was primarily due to high sales of its terminal products line. To increase deliveries, Telex expanded its manufacturing capacity of its terminal communications division last year in attempts to double this division's output.

About 21% of Telex's revenues are generated by sales to oems, and last year the company saw increased shipments as well from TCP's oem/peripherals division. The down-sized tape drive experienced increased acceptance among major computer manufacturers. Sales of the mini-tapes, on the other hand, have yet to reach Telex's anticipated levels, but the company reported those sales also increased in '82.

While Telex's sales outside the U.S. dropped to 16% of revenues from the 22% in 1981, the company expects a turnaround in this market during 1983. These sales, which are primarily through foreign distributors, are handled by TCP's International Division headquarters in Dallas.

Last year represented TCP's first full year of operation with George L. Bragg at the helm. Elected president and chief executive officer of this subsidiary in November 1981, Bragg came to the company with extensive management experience gained at Memorex, Collins Radio, and North American Aviation. And with TCP's sales up more than 36% last year, the company looks forward to even greater results for the years ahead.

52

TELETYPE CORPORATION

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Teletype Corp., the terminal manufacturing arm of Western Electric, spent 1982 getting ready for the real world. As part of the AT&T/Justice Department antitrust suit and the FCC's Computer Inquiry II, Teletype is on the verge of being set free from regulatory requirements that have hampered its growth in the past.

Last year was a bad year for Teletype. Total revenues declined to $372.9 million from $382.6 million in 1981. Earnings were off 4.5%, down to $23.7 million in 1982 from $24.8 million in 1981. These figures include Teletype's internal sales, which account for over 60% of its business. When these sales are removed, Teletype's revenues are $190.3 million for 1982 versus $175.8 million for 1981. This indicates that the Bell Operating Companies weren't buying as much during 1982 as they had in the past. Ironically, one reason for this falls back in the laps of the BOCs, as Teletype explains it.

The company's explanation for the less-than-spectacular showing in 1982 is revealing. Teletype has obviously not been doing well, and president John Pappas blames it on the sluggish economy, and more specifically on a delay by the Bell Operating Companies in getting three key new products tariffed. The models 4420, 4424, and 4430 display terminals were introduced in 1981. But during 1982, most of the BOCs' legal resources were devoted to the pending Bell breakup, Pappas explained. No one was available to shepherd the products through the tariffing process. "Owing to the tariffing delay, we had a substantial part of our forecast slip away because the equipment just sat there," he concludes.

With deregulation around the corner, Teletype gets out from under the uncertainty of being tariffed. But in the process, the company's relationship with its prime marketing arm, the BOCs, is also altered. As part of Computer Inquiry II, the BOCs cannot sell "new" customer premise equipment to commercial end users during 1983. "The key is 'new,' " pointed out Pappas. Teletype, however, is still permitted to offer additions and maintenance on its installed base of terminals. Another change will be that Teletype can no longer sell to end users directly, and the company must set up a separate entity or subsidiary for that market. It will probably take Teletype a while to work through all the legalese of its new franchise, but once the company does, it should be in for smooth sailing.

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NORTHERN TELECOM LTD.

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Canada L5B 3A2
(416) 275-0960

In 1982 the annual reorganization of Northern Telecom's office equipment division occurred in September (after earlier reshuffling in 1979, 1980, and 1981). Now telecommunications gear sold to users as private branch exchanges—a profitable business where Northern has a significant marketing and technological edge—will be part of the Integrated Office Systems group. The IOS includes the sickly data entry terminal and distributed data processing products Northern acquired several years ago but still hasn't turned into a profitable operation.

Once again chief executive Walter Light had to report that the office systems business lost money—$98.5 million last year, after more than $100 million in losses over the past two years. Part of the red ink was due to write-offs for thousands of leased terminals considered obsolete. DATAMATION estimates that office systems dp revenues declined 17.5% to $134 million in 1982; service revenues declined modestly to $51 million. Total dp revenues dropped 16% to $185 million.

Northern's primary business prospered last year, easing the pain of the IOS losses. Total revenues increased 18% to $3 billion, with net income also advancing smartly—up 25% to $151 million. Sales south of the Canadian border were a big boost to the Toronto company's balance sheet, with U.S. sales up $308 million or 35%. Its digital PBX equipment gained market share from AT&T and other vendors. Technological cooperation agreements with important computer companies like Digital Equipment and Sperry further cemented Northern's role as a key telecommunications supplier to corporate clients.

As for office automation, the oft-expressed market goal of Northern's managers when the ill-fated dp acquisitions were made in 1978, the important new products are as much as two years away. Last year Northern announced that an improved Displayfone, a combined telephone and terminal, will soon be available with a screen and keyboard designed for adults, not Lilliputians. By 1985, the company said, it should have a complete line of OA products, including terminals, desktop computers, and distributed data processing systems. A new disk and tape memory system for oem as well as internal use was also announced. With research and development spending up 27% last year to $230 million, Northern is making the financial commitments to the office information processing marketplace, but whether it is too little, too late, remains to be seen.

54

TANDON CORPORATION

20320 Prairie Street
Chatsworth, CA 91311
(213) 993-6644

Since its humble beginnings in 1975, this former one-room "garage" operation has profited from a single and simple strategic aim—the best possible product at the lowest possible price. This must be the perfect combination for hitting the jackpot, because in calendar 1982 the disk drive maker's steady profit stream suddenly turned into a torrential river. Total revenues surged to $177.1 million to score the fourth largest percentage increase on the survey (see Gainers table).

Tandon also registered triple-figure percentage growth in net income, earnings per share, and stock price. Total profits were up 206.4% to $19 million; earnings per share at 86 cents climbed 160.6%; and the company's stock finished the year at 31½, a gain of 121%.

Income wasn't the only thing expanding at Tandon in 1982. A new production plant in Singapore became operational in January to expand the manufacture of 5¼-inch floppy drives and was later doubled to include 5¼-inch Winchester rigid disks. In August Tandon broke ground on a new 61,000-square-foot facility in Thousand Oaks, Calif., that it says will triple its production capacity of 8½-inch floppy drives.

In midyear the company added seven new models of drives, both floppies and Winchesters, to bring its total to 20. Following the "smaller is better" principle, the new models are all 5¼-inch devices. Tandon attacked the price curve to produce a $50 floppy drive with 250KB for the home computer and electronic typewriter markets. The company also unveiled a 1MB floppy drive for $260; a 2MB floppy drive for $325 in oem quantities; and a 6.4MB (one platter) Winchester drive expandable to 12.8MB (two platters) and 19MB (three platters), priced at $400, $500, and $700, respectively. A 31MB closed-loop Winchester selling at $1,000 in oem quantities was also announced, but won't go into production for some time. Yet to be announced is a new 3½-inch drive that reportedly is similar to, but more powerful than, the Sony 437.5KB device announced over two years ago.

The key to these new products, and to Tandon's business in general, is its very high level of integration in the manufacturing process. Almost 80% of all parts and components—including the magnetic recording heads in which Tandon got its start—are manufactured in-house. As well as driving down production costs, such integration helps increase volume. The company is believed to have exceeded 90,000 5¼-inch and 12,000 8-inch floppy drives a month in 1982, and by year-end was shipping 5,000 hard disk drives a month. The company's client base, which is exclusively oem and numbers over 700, includes such big names in the personal computer business as Commodore, Radio Shack, and TeleVideo.

To accommodate this growing customer base, the company upped its staff to 2,500 from 1,400. And to anticipate future needs, Tandon's R&D spending soared 150% to $7.5 million for calendar '82. Following a two-for-one stock split in August, the company further strengthened its cash position by raising $90 million from a third public offering in November.

Although analysts warn that Tandon might eventually cut its own throat by persistent price slashing, for the present the company can rest assured that its seven new products will warrant a substantial volume buildup for at least the next year or two.

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THE BOEING COMPANY

2810 160th Ave. S.E.
Bellevue, WA 98008
(206) 763-1650

While the Boeing Co. as a whole was down in revenues and profits for 1982, its computing services division saw revenues rise almost 19% to $171 million from $144 million the previous year. The aerospace company has apparently found success in capturing new government timesharing business and in developing new markets in recent years.

Set up as a separate subsidiary in 1970, Boeing Computer Services Co. supplies its parent corporation with computing services. Due to the oscillatory nature of the aerospace business, however, it has tried to insulate itself and seek profits from the outside marketplace. In doing so, Boeing Computer has capitalized on the engineering expertise its parent has developed and has sought new markets such as microcomputer software. The firm's marketing efforts currently concentrate on three main areas: financial accounting systems, data processing managment, and engineering. Each area has seen product enhancements in the last year, as new remote services, software packages, and hardware were introduced.

In engineering, the company had its first full year selling time on its Cray supercomputer, acquired in 1981. Designed to handle large-scale computation, the Cray computer is used in modeling and simulation applications. Boeing last year introduced an engineering workstation, based on Digital Equipment PDP-11/23 hardware, to help remote users prepare finite element modeling and structural analysis programs for execution on the Cray and other large-scale scientific processors located in Seattle, Wash.

In the financial systems area, Boeing introduced a resource accounting software package for the IBM mainframe user that keeps track of computer usage and bills users accordingly. Called Facts, the software is designed specifically for managing large, multi-user projects. The company unveiled enhancements to its EIS decision support systems, including advanced modeling, color graphics, and 3270 display support.

In data processing management, the company began offering Mathematica's Ramis II database management system and Rim, a relational database manager developed under contract with NASA. Both systems are offered as remote computing services while Rim is also available as a software package. In addition, an Interactive Program Development service was introduced to help users write applications programs for IBM mainframes.

Last year Boeing entered the microcomputer software market, offering a set of programs designed to perform common office tasks like word processing, spreadsheet, and data entry. Packaged under the name Bits, the software is being sold for the IBM and other personal comptuers.

Boeing declines to detail its commercial customer base, but said that in 1982 it won major awards for remote computing from the National Park Service, the Air Force, General Services Administration, National Bureau of Standards, and the Commonwealth of Pennsylvania.

The company claims to serve more than 2,000 customers in the U.S., Canada, and the United Kingdom and says it is the largest supplier of teleprocessing services to the U.S. government under its Teleprocessing Services Program.

In addition to remote services and software packages, the company offers consulting, customer programming, training, facilities management, database services, and specialized services for the thrift industry.

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INFORMATICS GENERAL CORP.

21031 Ventura Blvd.
Woodland Hills, CA 91364
(213) 887-9040

Informatics General Corp. (formerly Informatics Inc.) experienced modest growth on almost all fronts in 1982.

Revenues were $170.0 million, up 13% from $150.3 million in 1981. Net income in '82 was $5.5 million, a 7.8% increase over the 1981 level of $5.1 million. Software revenues went to $68 million from $54.5 million, while services revenues moved to $60.3 million from $58.7 million. Professional services counted for $39.8 million in revenues in 1981 and for $45.4 million in 1982. Number of employees went to 2,600 from 2,470, and earnings per share to $1.49 from $1.47. Only R&D expenditures were down from 1981 levels, dropping to $5.8 million from $6.7 million.

During 1982, the company changed industry segment reporting to cover two categories, cross-industry and vertical markets. In the year, cross-industry revenue increased 7% while vertical market revenue was up 23% over comparable 1981 results.

Informatics is increasing its emphasis on vertical markets, particularly legal, insurance, distribution, and accounting. Toward the end of '82, the firm was anticipating loss of a few long-standing processing contracts but was banking on offsetting these losses with growth in law, accounting, and insurance markets.

The company changed its name in early 1982 "because the term 'informatics' was becoming generic for information science," and had even shown up in Webster's dictionary.

In midyear, Informatics General made an 850,000-share stock offering at $21 per share that, combined with positive cash flow from operations, brought its cash and short-term investment position at year-end to more than $20 million.

During 1982, Informatics became a value-added remarketer (VAR) to IBM with the signing of an oem agreement for quantities of the IBM P.C. to be offered along with Informatics software to Informatics' insurance industry customers.

57

SHARED MEDICAL SYSTEMS CORP.

P.O. Box 675
King of Prussia, PA 19406
(215) 296-6300

For the last 14 years Shared Medical Systems has made a good business out of supplying hospitals with computer processing services. Last year was no exception. While the Pennsylvania company fell short of matching the revenues of its major rivals, it outstripped the processing powerhouses of CDC, CSC, and EDS when it came to growth margins.

SMS's calendar year revenues of $165.7 million (all from processing services) were up 26% over 1981. Corporate profits also grew 25% to $41 million.

During 1982, SMS provided timesharing services and turnkey minicomputer systems to more than 600 acute care hospitals and physician groups. The timesharing services included both financial and database management. COMMAND, a patient database, is the company's main database service.

Its ACTION line of turnkey patient care systems, which have been on the market seven years, is based on Digital Equipment's PDP-11/70 and VAX minicomputers, as well as IBM 4300 and larger IBM mainframes. The application areas include laboratory, pharmacy, radiology, and medical records.

In the new product realm, SMS introduced a laboratory information system and a case-mix management system that serves as a decision support tool for hospital executives.

The firm's R&D expenditures have steadily risen over the years. In 1981 SMS increased its investment in R&D to $10.6 million. Last year R&D spending rose 29% to $13.7 million. This stepped-up spending reflects the company's desire to broaden its product base in the burgeoning health care market.

58

EXXON CORP.

1251 Avenue of the Americas
New York, NY 10020
(212) 398-3093

The world's largest oil company had some welcome relief last year from the precipitous decline in crude prices: Exxon Office Systems of Stamford, Conn., and its other electronics businesses showed a profit after incurring a $48 million loss in 1981. Known as "other operations" at Exxon, the old Vydec office terminals, Zilog semiconductors, and other components and systems posted $37 million in profits in 1982. One infinitesimally small blow struck for diversification.

DATAMATION estimates that Exxon office systems sales were $165 million in 1982, or about the same level as last year. While Exxon refuses to provide figures, it admitted that EOS was still losing money—only Zilog's successful microprocessors and other chips made money for "other operations."

The profit problem at EOS is due to the aging of the decade-old Vydec line, but that was arrested in mid-1982 with the introduction of the Series 500 workstation, or "information processor." This is the key building block to the EOS office automation strategy: over the next few years EOS will introduce add-on packages to upgrade the $6,500 standalone 500 into clustered workstation and personal computer configurations.

Early in 1983 EOS announced the migration path from standalone to clustered OA—the 8400 shared memory module. Several Zilog 16-bit microprocessors controlling up to 2 megabytes of fixed disk memory expand the meager workstation programming to include electronic mail and other advanced filing techniques. More elaborate word processing functions, such as pagination, headers, footers, and footnotes, and electronic cutting and pasting of dissimilar documents, are also included.

Exxon officials are optimistic that the new OA systems based on the 500 workstation will reposition the company in the mainstream after many years of watching other companies pass.

59

SIGNAL COMPANIES INC.

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La Jolla, CA 92037
(619) 457-3555

While many disk drive manufacturers were racking up fantastic sales increases, Signal Co.'s drive maker, Ampex Corp., was having problems. Dp revenues declined 8% to $163 million in 1982, mainly because of decline in sales of its 14-inch Winchester and 5¼-inch drives to the oem market. Though major customers such as Tandem Computers thrived last year, Ampex claims that the oem market growth was slower than anticipated.

Other dp product lines for the company had an upbeat year, the company reported. Shipments of Alar thin film media for high-speed disk drives doubled in 1982 and the company is doubling manufacturing capacity. That old standby, core memory, continues as a viable market for Ampex because of the military's interest in nonvolatility. A minor player in the flat video display terminal business, Ampex nevertheless introduced two new models.

Tough competition in Ampex's primary product lines, magnetic tape for the video and audio recorder markets, battered the company's balance sheet last year—overall Ampex operating profits fell almost 50% to $23.3 million in 1982. After taxes, write-offs, and overhead, the picture was even worse—net earnings collapsed to $1.2 million from $21 million in 1981. The company noted that much of the earnings decline was due to problems—the phase-out of certain products and factories, the dissolution of a Toshiba-Ampex joint venture, and the effect of a strong dollar in overseas markets.

Given the profit crunch, it should come as no surprise that the company laid off 19% of the work force. Ampex was able to protect the research and development budget, which remained flat at $31.8 million in 1982 compared to 1981.

60

GENERAL INSTRUMENT CORP.

1775 Broadway
New York, NY 10019
(212) 974-8700

While bettors may have lined their pockets using the information flashed over its AmTote wagering systems, General Instrument's Data Systems division barely finished in the money. If bettors had put something down on the division's performance, they would have just about broken even.

Hurt considerably by the frantic competition for lottery contracts in most states, the Data Systems segment of the company posted a 1.8% revenue increase over 1981. This was way below the overall company increase of 10.7%, since General Instruments just broke the $1 billion barrier, compared to 1981's $905 million. Total corporate profits reflected the overall success, jumping 23% to $103.3 million from $84 million. Earnings per share rose 20.6% to $3.27 from $2.71.

The company installed six new Totalisor Systems during the year, bringing the total to 33 serving over 60 of North America's largest racetracks. New business also included two jai alai frontons, an area of promising but limited potential due to the small number of frontons throughout the country.

General Instrument hit some winning numbers in state lotteries. New Hampshire selected the company to supply its on-line daily numbers lottery game. The Massachusetts Lottery commenced operation using an AmTote system. The Ohio Lottery has grown sufficiently to permit the installation of over 1,600 high-performance terminals. And New Jersey, home of the world's largest on-line daily numbers game, increased its number of terminals to more than 2,300.

Lest you think General Instruments leaves part of its fortune solely to chance, the company at the end of November acquired Energy Management Corp. of Towson, Md. Energy Management manufactures and distributes microprocessor-based energy management systems, marketing them primarily to major supermarket and retail store chains. The acquisition provides General Instrument with an opportunity to enter the rapidly growing energy management market and at the same time, so the theory goes, offers value-added services that will build upon General Instrument's local area network (LAN) and microelectronics capabilities.

61

NEC INFORMATION SYSTEMS INC.

5 Militia Drive
Lexington, MA 02173
(617) 862-3120

This six-year-old subsidiary of the $6 billion Japanese conglomerate, Nippon Electric Co., appeared to thumb its nose at the recession in this country. Sales from its three product areas—small business computers, personal computers, and oem peripherals—jumped a total of 60% to end the calendar year at $160 million. Small business systems accounted for $18 million; microcomputers brought in another $42 million; and peripherals contributed the lion's share of the total with $95 million. Software revenues accounted for a small but growing $5 million.

The highlight of the company's product year was the unveiling of its 16-bit IBM Personal Computer challenger, the APC (for Advanced Personal Computer). This $3,300 entrant supersedes the earlier 8-bit PC 8000 and, like that machine, offers the large library of applications software surrounding CP/M. The company also announced the availability of a 12MB 5¼-inch Winchester hard disk for the APC. With APC shipments beginning in the summer, both the 8-bit and 16-bit micros proved revenue producers in '82.

A selection of new vertical software packages for NEC's Astra small business computers also debuted in '82. These included Astra LAW, a legal, accounting, and word processing combination; a client accounting audit assist program; and a software package for pharmacists. Another first for Astra: it was equipped with IBM 3270 emulation.

A steady stream of peripherals rounded out the flow of products last year. These included a new Spinwriter letter-quality printer with 15 new font styles, an 85MB 8-inch Winchester disk, and an 8½-inch half-height flexible disk.

All of these products were manufactured outside the U.S., but that situation could change this year with the opening of a new plant in Boxboro, Mass.

For the second year, employment was up; it increased 60% to 400 people.

62

CPT CORPORATION

8100 Mitchell Road
Eden Prairie, MN 55344
(612) 937-8000

This office automation specialist ended the calendar year in spectacular style by scoring its 42nd consecutive profitable quarter, maintaining its earning momentum.

It was a year that saw CPT unveil a new line of word processing systems; a new flexible office network scheme to tie together the dp and wp branches into what the company called the "one information processing stream"; and a year in which dealers and distributors were added in record numbers.

The whole ensemble of events suggested a strategic shift from word processing to the larger and more embracing office automation market. And the maneuverings were reminiscent of the earlier route taken by CPT's chief competitor, Wang.

Revenues climbed 28% to $158.5 million, with 34% of this coming from overseas business, principally in Europe. The growing importance of the European business was reflected in the pronounced ergonomic or human engineering design focus of the new four-model CPT 8500 wp family, and by the creation last February of European HQ in Leiden, the Netherlands.

The new 8500 series—selling from $6,990 to $10,990, excluding printers—features full-page, black-on-white displays, tilted consoles to minimize glare, and low-profile movable keyboards. Each model is fully upgradable and compatible with CPT's existing products. Late in the year the company also added a combination wp/personal computer, the 96K CPT 8505, listing at $4,990, and enhanced word processing software called "H."

Throughout the year, both sales and R&D expenses increased noticeably, with R&D climbing 53.7% to $8.3 million. These costs were reflected in net earnings, which grew by a more moderate 16.4% for the year, to $16.3 million.

While profit margins proved a bit of a disappointment, the year was also smudged by intensive internal management reshuffling, including the resignations of CPT's president, the vp of marketing, and the chief financial officer. These management uncertainties, allied with the less than explosive growth in net profits, were reflected in the company's stock, which ended the year down 0.7% at just below 18.

63

INTERGRAPH CORPORATION

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Intergraph continues to grow by leaps and bounds in the CAD/CAM market. Its 1982 revenues rose 71% to $155 million, and profits went up 57% to $13 million. That represents the third straight year of enormous revenue and profit jumps; since 1979, both revenues and profits have grown more than 400%. This tremendous growth is also reflected in the number of employees, up from 765 in 1980 to 1,275 in 1981 and to 1,800 in 1982.

Intergraph has been able to position itself for this rapid expansion by presenting a full product line to the rapidly expanding architecture/engineering/construction (AEC) and mapping/earth sciences (MES) fields. Its graphics systems include a color display system, an entry-level interactive system based on the PDP-11/23, and a VAX native mode interactive system that allows users to integrate other applications with the CAD/CAM applications. In addition to the cpu, a typical system could consist of a file processor, tailored application programs, an oem printer or plotter, and microprocessor-based dual-screen workstations.

In the AEC area, applications include plant design, drafting, and data management for complex industrial projects. MES applications encompass land use and resource management, cartographics, and special processing and civil engineering for the petroleum industry.

Intergraph markets its products to end users through a direct sales force and to foreign end users through wholly owned subsidiaries in Brazil, Japan, Korea, and Europe. A major sale in 1982 was to the Hospital Corp. of America, the nation's largest chain of hospitals. The sale called for Intergraph to provide CAD/CAM workstations and systems with software tailored to hospital architecture. All of the systems will be tied to a central database, which contains diagrams of "ideal" layouts for every type of room in the hospital as well as information about which kinds of rooms need to be adjacent to which other types. The idea is to ensure that all new hospitals will have the same standard features.

The company's first public stock offering, in April 1981, resulted in sales of 1.5 million shares at $18 each. Since then, the stock has climbed to a 1982 closing of $47.75, with stock splits and new offerings yielding a total of 11.6 million shares outstanding. Proceeds from the stock offerings were earmarked for capital improvements and equipment purchases. The influx of cash also helped the company increase R&D spending $19.7 million, up 65% from 1981 and over three times the 1979 level.

64

UNITED TELECOMMUNICATIONS INC.

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United Telecommunications Inc., an independent telephone company in eight states and a multifaceted telecom supplier and services company with total 1982 sales of $2.4 billion, earns its DATAMATION 100 ranking on the performance of its United Telecom Computer Group. In 1982 setbacks outweighed gains for the Kansas City-based UTCG.

Total corporate profits plummeted 18.7% to $201.6 million from $247.7 million. Computer services and software sales were depressed by a weak economy, particularly in energy engineering and utility markets, and by declining demand for generic computing services. The UTCG revenues fell to $150.8 million in 1982, down from $160.5 million in 1981. This is minus internal sales of 9.5% or about $16 million each year.

On the positive side was the performance of Megatek Corp., the San Diego-based producer of interactive computer graphics hardware and software and one of three business units that make up UTCG. Demand for its products enabled that company to expand production capacity and increase sales to $33.8 million from $15.7 million in 1981 and $13 million in 1980.

The group in 1982 expanded its software and professional services capabilities with acquisitions and exclusive software agreements. It acquired Information Systems of America Inc. (ISA) of Atlanta; Seed Software (formerly International Data Base Systems) of Philadelphia; and United Computer Resources Ltd. (UCR) of the U.K.

ISA develops custom and packaged software for business and insurance applications. Seed Software is the developer of a dictionary-run database management system of the same name, and UCR is a professional services operation that develops custom software, primarily for IBM, ICL, and Wang hardware.

Under a joint marketing agreement entered into in 1982 with Intercomp Resource Development and Engineering Inc., the Computer Group is offering Intercomp's energy recovery software products exclusively, on a remote basis.

Last June the group introduced SUPRA Service, a repackaging and upgrading of its Cray 1 service offering, followed closely by introductions of UniMail, an electronic message system, and CommTrack, a telephone usage tracking service.

65

BASF SYSTEMS CORPORATION

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BASF Systems Corp. is a tough nut to crack when it comes to pinpointing dp revenues. Based in Bedford, Mass., the company is the U.S. arm of $16 billion BASF, headquartered in Ludwigshafen, West Germany. This is the nucleus of an operation stretching around the world, embracing nearly 300 companies and employing 116,000 workers who produce more than 6,000 products for world markets, ranging from oil, gas, chemicals, plastics, and dyestuffs to consumer products.

BASF Systems, employing some 1,200 workers, is estimated to have accounted for less than 10% of the parent's 1982 revenues, or about $150 million in sales. That sum is almost 50% higher than BASF Systems' revenues in 1981.

It was BASF researchers who in 1934 developed the first practical method for magnetic media recording. It is on such a foundation that BASF Systems' media sales are built. Last April the company announced the availability of a full line of quad density FlexyDisks, individually certified to be error-free for all double density, 96 tpi applications. And in October, BASF Systems unveiled the Qualimetric line of computer media products, thus setting a new international standard of quality for the company's family of computer products. First to earn the Qualimetric seal was the FlexyDisk line. Not only are these disks certified 100% error-free, but each carries a lifetime warranty against defects in workmanship and materials. Eventually, BASF expects all its products to have earned the Qualimetric designation.

To further its quest for excellence in product quality and reliability, the company is investing heavily in a number of research projects, including a solvent recovery system that not only cleans the environment but also recycles purified solvent for reuse; a computerized tape coating system that uses the latest laser technology to ensure precise tolerances; a modern clean room that purifies room air 20 times per hour; and new plastic molding and cassette testing equipment and a special environmental testing chamber.

66

DIEBOLD INC.

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When you mosey on down to your friendly neighborhood 24-hour automatic teller machine (ATM) and push those buttons for some desperately needed cash, chances are you're using a Diebold product.

The company has made its name in the manufacturing of bank security systems, but it's beginning to make a significant share of its money through its TABS ATM units. TABS is one of the most prevalent ATMs in the proprietary and shared ATM networks around the country.

Doubters can check the 1982 performance results. DATAMATION estimates dp revenues leaped 66.6%, to $150 million from $90 million. That was far above the overall corporate revenues increase of 10.8% to $427.6 million. It also exceeded the 43% rise in total corporate profits, as well as the 42.4% jump in earnings per share. Those numbers were a big hit on Wall Street, where Diebold's stock began 1982 at 26⅞ and finished it at 74½.

More than 14,000 TABS systems were delivered in the U.S. during 1982. As the financial industry has changed with the times, so has the use of ATMs. No longer are the machines confined to banks. They are now installed in supermarkets, hospitals, airports, office buildings, and other centers of high consumer traffic volume. Everywhere the ATMs go, Diebold is sure to follow.

The company plans further penetration into the general ATM market, with specific attention focused on retail financial services delivery and nonfinancial institution settings. The former's potential lies in its cost containment prospects; the latter's attraction is its broadened ATM utility potential.

As part of its thrust into the international market, Diebold last September signed an agreement with Philips Data Systems, a subsidiary of N.V. Philips of the Netherlands. Under the agreement, Philips Data Systems will market and service Diebold's ATMs in 35 foreign countries. Philips Data Systems will also market Diebold's ATMs under the company's label.

With an expanding ATM market, Diebold's performance will be pushed even more in 1983.

67

ALLIED CORPORATION

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Allied's presence in the Top 100 represents the specter of Bunker Ramo, which it gobbled up in 1981 for $347 million. Bunker Ramo was further digested this year as it was split in three, each part of which was then merged with other Allied segments to form a new corporate alignment. The result is that all of Bunker Ramo's dp operations are now a part of Allied Information Systems Corp., in Trumbull, Conn. AISC also includes fragments of the Eltra Corp. and the Mergenthaler Linotype Group, as well as some of Bunker Ramo's non-dp operations. AISC announced in October that it plans to build a $6 million, 66,000-square-foot headquarters building in Trumbull to house the merged entity.

Allied's Electrical and Electronics Group, of which AISC is a part, brought in $882 million in 1982, a 7% increase over 1981; profits tumbled 90% to $3 million. Allied Corp.'s total revenues decreased 3.8% to $6.2 billion, while its profits dropped substantially—22%—to $272 million. Allied Information System's dp sales climbed 14.2% to $147.1 million, but profits declined because of increased R&D expenditures and the startup costs involved with new product lines.

Bunker Ramo's primary dp-related products are information systems designed for the brokerage and banking industries. During 1982 the company introduced a new line of these products that has recently been renamed the Aladdin series. The Aladdin 40 (née Intellimation 10), which was announced in September, is a personal computer capability for Bunker Ramo's quotation terminals. The microcomputers enable stockbrokers to perform evaluations of customer portfolios, create and analyze graphics, do word processing, and perform other functions on the same terminal used for stock quotations and database queries.

A more powerful 68000-based microcomputer, the Aladdin 20, was introduced in October 1982 and the multiple microprocessor-based Aladdin 30 was introduced this March. Deliveries were scheduled for the second quarter of 1983.

Allied Corp. continued its diversification into the dp arena in early 1983 with its piecemeal acquisition of Instrumentation Laboratory Inc., the maker of the Pixel line of graphics-oriented microcomputers.

68

DYSAN CORPORATION

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Dysan had two main objectives in '82—to increase profitability and to expand the volume of its existing two- and three-year-old products. The magnetic data storage specialist came through with flying colors on both counts.

Net sales for the year that ended Jan. 31, 1983 climbed 37% to $142.8 million. Net income surged 76.4% to $9 million, despite a whopping 61.3% increase in R&D spending to $25.5 million, or 17.9% of sales.

Large increases in volume deliveries of both its rigid and floppy disk media enabled the company to drive down the cost of sales from 64.4% to 58.7%.

In its characteristic low-key, behind-the-scenes manner, Dysan continued to push for joint R&D ventures. In fact, last year the company pumped more money—$13.8 million—into the development activities of these venture startups than it did into its own internal R&D.

Most of this money went to Applied Peripheral Systems, which is developing (and has received initial orders for) a 412MB, thin film head, 14-inch rigid Winchester disk drive. Other funding has gone to the Amlyn Corp. for cartridge-type flexible disk drives and to Tabor Corp. for 3¼-inch flexible disk drives, as well as to others.

The motivating force for this funding is the long-term development of markets for new Dysan products, as well as second-sourcing and boosting of its product line. But there can be other benefits as well. Witness Seagate Technology, which has been so successful at creating a new 5¼-inch Winchester disk business that it had a growth rate of 150% and just missed the DATAMATION Top 100. At the end of calendar '82, Dysan's 25%-plus stake in Seagate, representing an investment of some $450,000, was worth $100 million.

Such success will herald a greater push away from external equity and debt markets by Dysan in the years ahead, and very little sale of its own common stock to the public.

One big question still concerns analysts and investors—namely the company's high ratio of oem to end-user customers, which stands at 75:25. One worrying note is that last year one client, Storage Technology, accounted for 20% of disk media sales, or $27 million. That's taking a big gamble. The company has addressed this concern with the creation of a new end-user sales force.

69

CRAY RESEARCH INC.

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Seymour Cray likes to joke that "we sell a machine a month. We've always sold a machine a month." That's not quite accurate, but it's close enough. In 1982, the company bearing his name—he stepped down from its chairmanship in 1981 to concentrate on research—installed five new supercomputer systems, compared to 13 in 1981 and nine in 1980. Total revenues for the company were $141.1 million, excluding two systems installed in-house; that represents a slowing of the tremendous growth Cray saw in 1981, but was still an impressive 39% jump. Cray reached a milestone in November with the installation of its 50th new supercomputer system 10 years after the company was formed.

Despite the revenue jump, Cray's profits increased only 4% to $19 million, for several reasons. As crosstown rival Control Data's Cyber 205 became a formidable competitor to the Cray supercomputers, Cray was forced to cut prices up to 25% on its product line. The X-MP models, introduced in April, cost only $9 million to $11 million by year-end, compared to the $11.4 million to $14.5 million price tag at introduction. The Cray-1S model, which had cost in the $8 million to $13 million range, are being replaced by the Cray-1M, which costs half as much. The Cray-1M, introduced in September, incorporates metal oxide semiconductor memory to reduce system costs to a level that Cray expects a significant number of new users will be able to afford. Cray currently has 70% of the supercomputer market.

Cray's price reductions convinced seven installations to convert leases into sales in 1982, compared to only one such conversion in 1981. Nonetheless, this did not generate enough revenue to boost profits. Another negative pressure on Cray has been the demand for upgrades to previously installed systems, which generate less revenue than new installations. Cray was disappointed as well that of the four systems slated to be shipped to France in 1982, only two were installed; a third was installed in early 1983.

Cray's profits were also held down because of internal pressures. The company's R&D budget represented 20% of revenue in 1982, compared to 16% the year before and 13% in 1980. The $28.3 million Cray spent on R&D in 1982 was 74% more than it spent in 1981, the second straight year R&D expenditures more than doubled.

A large portion of the R&D budget in both years went to the Cray-2, the upcoming successor to the Cray-1 series. (The X-MP is seen as an intermediate machine.) The Cray-2 will be six to 12 times faster than its predecessors, using a four-processor architecture and liquid immersion cooling.

70

WYLY CORPORATION

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Nothing went right for Wyly during 1982. While revenues from the software processing sectors increased, earnings were depressed. At the hardware end, Wyly found the going so tough that it simply couldn't stand the heat and took a $11.9 million loss to get out of the kitchen.

By November, the pressure was so great that president John Kason resigned, and the directors appointed J. Allen Hufft to the post. Hufft, a 14-year veteran of Wyly, stepped in and promptly announced the impending loss, which pushed the stock down and disappointed shareholders and analysts.

By the time year-end results were reported, the company had bad news indeed. All 1981 numbers were restated, so that revenues increased to $140.5 million from $118.8 million in 1981. Profits, however, took a nose dive to a loss of $7.8 million in 1982 from $9.7 million in 1981. (The net loss of $11.9 million was reduced by tax benefits.) Hufft explained it this way: "Application and systems software results were significantly better than last year but not enough to offset lower earnings in other businesses. The earnings decline in continuing operations reflects no growth in sales and lower margins in the turnkey systems business, along with increased reserves for doubtful accounts and inventory adjustments. Additionally, our computing services business had lower profits, partly in order to maintain our business upturn capability."

In 1982, Wyly strengthened its systems software business, which serves IBM and IBM-compatible data centers. Introduced were UCC Seven BASIC, an expansion of its automated data center production control offering, and UCC Eight, a product for management support systems.

Wyly entered the micro software business in early 1983 by buying the distribution rights to Contex Management System's popular MBA product. Contex Management is, however, still selling this product, and competition is expected to be stiff.

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NIXDORF COMPUTER CORPORATION

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This U.S. subsidiary of the privately owned West German dp and office products conglomerate, Nixdorf Computer, AG, declined in the DATAMATION 100 rankings, falling 17 places.

U.S. revenues from the New England-based subsidiary fell 12.2% to $140 million. According to U.S. management, the decline was expected, and was part of a plan to get the company back in line with more realistic market objectives, which began with the shedding of around 12% of its employees in late 1981.

The company said that tighter controls over costs and expenses through 1982 had now moved its operation into the black. The net profit increase had not been disclosed when the DATAMATION 100 went to press. All financial details of the West German parent—whose revenues are closing on $1 billion—are kept under a veil of secrecy until their announcement at the vast Hannover Fair trade show in April.

The mainstay of last year's dp revenues—all minicomputer related—was the company's 600 series family of intelligent terminals, an upgrade to the old line of Entrex data entry devices that Nixdorf bought out.

Last spring two new products were announced to the U.S. marketplace. One was an IBM 4300 pcm offering, the 8890 series, which is aimed at IBM's DOS base and offers Nixdorf's own system software. Also unveiled was an SNA-compatible distributed networking family, the 8860, which drew an order for 50 systems from the National Education Association in Washington.

Details of a cooperative agreement with Spartacus Computers, Bedford, Mass., to develop a new virtual machine (VM) operating system for the 8890 pcm contender were also revealed during the year.

The U.S. subsidiary lost two of its key officers during the year: president Carl Janzen left for a senior position at Burroughs, and product planning and marketing director Mike Backler left to join a new venture.

The company didn't lay off a large number of employees in 1982 as it had in 1981, and ended the year with some 1,700 persons on the payroll.

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CONTINENTAL TELECOM INC.

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The U.S. Department of Justice's agreement with AT&T had a profound effect on Continental Telephone Co., which supplies phone service to 37 states and the Caribbean, with more than 2 million customers. An early signal of the impact came in May 1982, when Continental changed its name to Continental Telecom and started using the acronym Contel. This change was followed quickly by the acquisition of STSC Inc., a processing service company that specializes in the APL program language. Following up that acquisition was the purchase of Cado Computer Systems, which was 88th on the DATAMATION 100 in 1982. These purchases bring Contel to 72nd place in 1983. During this time Contel was buying shares of MAI, which has turned into a very profitable investment (see MAI profile, No. 31).

To end 1982, Contel and its partner Fairchild increased their ownership of Space Communications to 50% each by buying out Western Union in late December.

Cado, meanwhile was having a difficult year. Revenues dropped 7.7% to $60 million because of the poor economy. During the year, it introduced a modular 16-bit product line called the Cado Tiger. Cado markets its products through a network of full-service independent distributors in 175 cities in 40 countries.

Contel is obviously going to become a very aggressive competitor in the dp market and the datacom war looming on the horizon.

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CENTRONICS DATA COMPUTER CORP.

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Centronics had yet another poor year in 1982. While revenues climbed 16.4% to $138.4 million, the troubled printer manufacturer lost $32.3 million—47.4% more than it lost in 1981. The company has not turned a profit since 1980.

The poor showing is particularly disappointing to Centronics because the company undertook several major structural changes to bring it back into the black. The company closed its facilities in Stevenage, England, and Dorado, Puerto Rico, and reduced the work force in its Ireland manufacturing facility to 25 from 175.

The company finally concluded a pact with Control Data Corp., NCR, and International Computers Ltd. that provided Centronics with a significant cash infusion. Under the agreement, a company called Computer Peripherals Inc. was merged into Centronics in exchange for 4.9 million shares of Centronics common stock. The owners of Computer Peripherals—CDC, NCR, and ICL—also gave Centronics $25 million in cash. The 4.9 million shares were divided in such a way as to give Control Data 35% of Centronics, and ICL and NCR 4.7% each. The agreement took effect July 1, and Computer Peripherals' revenues for the second half of 1982 are included in Centronics' 1982 revenues.

Computer Peripherals manufactures a series of line printers that is faster and more expensive than Centronics' line of dot matrix character printers. The entire merged product line now bears the Centronics name.

During the year, Centronics quietly terminated research and development on the Quietwriter stylus technology; it had been expected on the market in product form in 1981, but snags ensued and the product never made it out the door.

Centronics has apparently decided instead to concentrate on its Printstation 350 series of dot matrix printers and on conventional line printers. Three models were added to the Printstation family last month at the National Computer Conference. Centronics also indicated that it intends to fill the gap between the Computer Peripherals high-speed line printers and the Printstation series with a family of low-speed line printers, the first of which was also introduced at the 1983 NCC. The 350 products and the new line printer are gradually replacing the aging 700 series and the 6000 series printers.

Centronics does 75% of its business with oems, and one sign that the company may finally be turning around is that it signed almost 100 oem contracts in the last six months of 1982, including major agreements with Burroughs, Paradyne, and Redshaw. These are particularly welcome signs because Centronics has lost several oem contracts to Printronix recently. Hopefully, the company has turned the corner.

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PLANNING RESEARCH CORPORATION

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While the data processing revenues from Planning Research Corp. still constitute less than half the company's total revenues, the dp segment (representing two of PRC's four operating units) is experiencing a greater growth rate than the engineering side of the house.

PRC's dp revenue producers include PRC Government Information Systems, which serves primarily government agencies, developing software and systems and managing computer facilities; and PRC Computer Systems, a leading supplier of computerized real estate multiple listing services.

During calendar year 1982, PRC's dp revenues increased 30% to $138.4 million from 1981's $106.6 million—and that in a year when total corporate revenues climbed less than 1% to $320.7 million from $319.1 million. The bulk of 1982's dp revenues came from software sales (representing $103.8 million), while $23.7 million came from processing services revenues and another $10.9 million from sales of turnkey systems.

On the profit side, PRC finished 1982 with a net income of $7.8 million, up from $2 million in 1981. The unfavorable earnings report for 1981 was due primarily to closure of the company's unprofitable international computer software operations and its domestic property appraisal activities. But once it entered fiscal 1983, which began July 1 of last year, the company clearly had its feet once again on firm ground.

PRC Government Information Systems' largest award last year was a $5.2 million, one-year extension of its contract to manage and operate the National Aeronautics and Space Administration's Scientific and Technical Information Facility near Baltimore, Md.—a facility that PRC has managed since 1980.

Despite the condition of the real estate industry during 1982's sagging economy, PRC Computer Systems in September obtained eight new contracts and renewals totaling $12.6 million for computerized multiple listing services.

But while PRC won many competitive bids, it also lost some big ones. In midyear the company had announced its intentions to joint venture, or team up with other companies, on bids to win larger contracts. Those efforts had yet to pay off by year-end. A team of Burroughs Corp. and PRC Government Information Systems was not selected after a 26-month competition for a major Air Force contract to replace computer systems at 115 air bases around the world—although the competition itself provided PRC with more than $20 million in revenue. Also, a joint venture of PRC and other major companies was not awarded the major base operations contract it was seeking at Kennedy Space Center.

Despite these disappointments, PRC feels confident that 1983 will see it win at least its "fair share" of government work. In the meantime, the company's dp divisions continue to have success in obtaining new work.

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DUN & BRADSTREET CORPORATION

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As the largest disseminator of business information in the private sector, Dun & Bradstreet is a large user of computer technology—using it to develop and deliver nearly 2,000 products and services to more than 2 million customers worldwide. But D&B is also a provider of computer technology.

While dp revenues still constitute a small percentage of total corporate revenues, which last year were up 9.8% to $1.5 billion, dp is nonetheless a business area targeted for expansion. Last year saw dp sales slip 1.3% from 1981's $134.1 million to a 1982 total of $132.4 million. (The figures have been reduced by 4% in 1982 and 2.1% in 1981 for the purposes of this survey, as these amounts represented sales to internal divisions.) The primary dp revenue producers are National CSS, the Wilton, Conn.-based provider of timesharing services for industrial users and packaged software programs for use on in-house installations; and Zytron, which provides dissemination and storage of computerized information through its computer output microfilm services.

Reporting a slight decline in 1982 results, NCSS found itself the victim of the economic slowdown, as did many computer services companies. A major cost-reduction effort was instituted last year, including the reorganization of production and sales activities, in the hope that the company would round out 1983 as a leaner, more aggressive timesharing contender. Aiding that effort in '83 will be Multiple Funding Services Inc., the small software company NCSS acquired last June. Its software packages are aimed at the life insurance industry.

A major product announcement for NCSS during 1982 was the Nomad2 Information Center, which can be incorporated into customers' own computer systems to help make better use of internal dp capabilities. The offering also allows NCSS to participate in the growing in-house market for Nomad-like products. The Nomad database management system continues to enjoy good reception in the remote processor software market.

While NCSS found the going rough in 1982, Zytron's experience was quite the opposite. The company reached the Dec. 31 finish line with record revenue and operating income. Zytron's COM service centers continued to show strong revenue gains, and the transfer from in-house production to Zytron services by several large clients accounted for a significant portion of the revenue increase.

Signaling its commitment to expanded dp offerings, D&B in March of this year acquired Needham, Mass.-based McCormack & Dodge, the privately held supplier of financial accounting software packages. M&D, which had 1982 earnings of $2 million on sales of $38.5 million, was purchased for $50 million in cash plus a pay-out plan based on sales and earnings over the next three years. The company will report through NCSS.

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LEAR SIEGLER INC.

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The relatively mature dumb terminal market, as well as the prolonged recession, caused Lear Siegler to struggle through 1982 with mixed results. The Data Products Division of this diversified company sold more terminals than ever before, but strong competition from TeleVideo, Applied Digital Data Systems (ADDS), and others forced prices down. While lower component costs and manufacturing efficiencies eased the burden caused by the lower prices, margins were still trimmed. Consequently, 1982 represented the first year in a decade that dollar volume and earnings have been off, as the division's sales revenues dipped from $150 million in 1981 to $130 million last year.

Moreover, the pressures on the Data Products Division helped cause corporate revenues to drop 4.8% to $1.4 billion. Corporate profits dropped 21.1%, to $61.7 million from $78.2 million, and earnings per share dropped to $3.55 from $4.55. This corporation-wide decline was aggravated by two factors that did not affect the dp division. First, the devaluation of the Mexican peso hurt, since several divisions of the company maintain facilities in Mexico. Second, other corporate divisions are mired in industries ravaged by recession and maturity, such as automotive, machine tool, and aviation groups.

The dp divsion introduced several new products in 1982, which served to broaden its potential base in the competitive terminal market. Among these is the company's first printer, a color dot matrix unit that can produce near letter-quality or draft-quality output.

Other products introduced in 1982 include the ADM 22, 23, and 24 terminals. The ADM 22 retains a mixture of the features found in Lear Siegler's biggest seller, the ADM 3A, and in competing terminals. It is compatible with some direct competitors, including the ADDS Regent 25 and the Hazeltine 1500. The ADM 23 and 24 add different degrees of intelligence to the terminal.

The company is counting on this line of terminals and on the printer to improve the division's—and the corporation's—performance in 1983. The other divisions, because they are in more mature industries, are not expected to contribute as strongly as they have in the past. Nonetheless, the fourth quarter was the year's worst, indicating that the needed turnaround had yet to occur.

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MARTIN MARIETTA CORPORATION

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Starting out as an in-house dp department only 10 years ago, Martin Marietta Data Systems hit the big time in 1982. Its earnings growth of 25% annually for the past few years drew nods of approval from corporate officials and brought official recognition. In 1982 Martin Marietta granted the Data Systems Division full company status equivalent to its other operating companies. This means MMDS now gets as much space in the annual report as the other operating companies, a fact that reveals that MMDS had gross profits of $11.2 million in 1982. Besides more space and attention, MMDS is slated for expansion.

A beginning example of such expansion came in early 1983, when MMDS bought American Management System's suburban Washington, D.C., data center. MMDS bought the machines and accounts and plans to keep the employees. This gives MMDS three large data centers (the others are in Denver and Orlando).

MMDS provides a full range of computing services including timesharing, application software packages, and professional services. It maintains a nationwide data communications network and has a substantial presence in the manufacturing, distribution services, and government sectors.

MMDS is the producer of the popular MAS or Modular Application Systems, which easily integrates the functions that most manufacturers need, including master production scheduling, inventory control, and purchasing control.

Compared to Martin Marietta's total revenues of $3.5 billion, MMDS' $122 million is small potatoes. But given its new clout within the big corporation, there's little doubt that MMDS will expand its horizons in 1983.

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QUOTRON SYSTEMS INC.

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Founded in 1957, Quotron was the first company to offer brokers an electronic stock quotation system. Today the California-based company is one of the leaders in its industry, supplying on-line financial information services to more than 4,800 customer locations on a monthly fee basis. Customers include brokerage firms, banks, and insurance companies, as well as security, option, and commodity exchanges.

The past year was a period of solid growth for the company. Revenues continued their sustained growth and reached an all-time high of $120.9 million, up 37.2% from $88.1 million in 1981. Financial Information Services (FIS) revenues recorded a 39% rise to $110.4 million. Net income for 1982 rose 36% to a record $17 million ($1.05 per share) from $12.5 million (78 cents per share) in the prior year.

The information that Quotron's subscribers receive reaches them by way of the company-operated communications network. Last year Quotron upgraded its shared communications network (CARS) by installing a multiple Central Network Switching Center in New York City. This system offers customers increased connectability, improved response time, and additional capacity to support their own host computer applications. This year, the company will also offer a host computer-controlled printing capability. This service will support the production of hardcopy reports at remote branch locations using the CARS service.

During 1982, Quotron first demonstrated its financial office services system, the Quotron 1000, which provides customers with a full range of office services to support broker-related activities on their existing Quotron terminals. This new system enables users to perform such applications as analytical functions, client files and positions, text editing, electronic mail, data management, local personal processing, and calendaring. Based on the Unix operating system and using multiple Motorola 68000s, the Quotron 1000 offers a multiple bus structure that is expandable to support a full range of disk and tape drives, communications controllers, printers, office automation workstations, and graphics terminals. By year-end, beta sites had been established, and the company now looks forward to greater user acceptance of this new offering in 1983.

79

REYNOLDS & REYNOLDS

800 Germantown Street
Dayton, OH 45407
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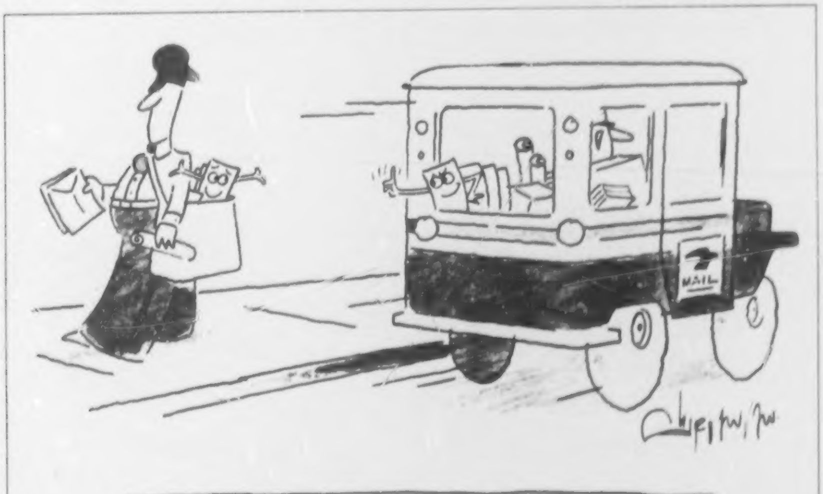
Reynolds & Reynolds sells computer systems and services tailored to automotive dealerships, a niche that has come upon hard times in the past few years. And, paralleling the slow growth of the auto industry, R&R came out of 1982 only slightly ahead of 1981. In fact, considering the inflation rate, the company actually lost ground. Corporate revenues inched to $224.2 million from $217.3 million, a 3.1% gain, and dp-related revenues crept to $120.5 million from $115.2 million, a 4.6% increase.



A LATE PAYMENT AND A FRIENDLY REMINDER NOTICE CROSS PATHS IN THE MAIL

CARTOON BY VAHAN SHIRVANIAN

This modest growth was not sufficient to make up for the lackluster 1981 performance, because the company fell short of its 1980 record of $121.5 million in dp revenue. In addition to slow revenue growth, earnings were also squeezed by a 14.8% increase in R&D spending, to $5.4 million. Nonetheless, the company was able to post $7.9 million in earnings, up 6.7% from $7.4 million in 1981.

The company's bread-and-butter products are still turnkey computer systems customized to the automotive industry, and these contributed $58 million in revenues in 1982, compared to $52 million in 1981. In late September, the VIM/NET system was added to this line; it is a micro-based system, unlike the minicomputer VIM III system already in place.

The company tried to diversify its product line late in 1981 with the Expansion 6000 series, geared to service contractors and to the medical group practice market. The company hoped to be successful by capitalizing on a base of customers who already buy Reynolds Business Forms (the company's other major product line). Modifications and enhancements late in the development cycle stalled this product, although the company hopes it will begin generating revenue in 1983.

While R&R has offered an on-line computer processing service for auto and truck dealerships who can't afford their own computers, this operation suffered declining revenues for the third straight year. By comparison, the company's batch processing services enjoyed a small increase in revenue; overall, the company's processing services grew 2% to $37.9 million.

One bright spot for the company's dp operations was the success of the new Reyna Financial Corp. This subsidiary provided financing for over 70% of the company's U.S. computer sales in its first year of operation. It was immediately profitable, contributing about 9% of the company's earnings per share.

Another high point was the corporation's successful conclusion of examinations by the Internal Revenue Service and Revenue Canada. In December, Robert G. Timberlake, the company's president and chief operating officer, died. He was replaced by executive vice president Terry D. Carder.

80

NATIONAL DATA CORPORATION

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Atlanta, GA 30329
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The end of 1982 marked the first full year of operation for National Data and Rapidata as a merged entity. The results were mediocre. Revenues increased 8.4% to $120.3 million versus $111 million for the same period in 1981. Earnings were up slightly to $10.6 million from the $10.2 million in 1981.

One reason for this slow growth is National's loss of its longstanding and highly profitable contract with Atlantic Richfield for credit card processing. National's president, L.C. Whitney, stated in the May 30 annual report that he expected the company to have a 10% to 15% rise in revenues and a 15% rise in profit by fiscal year-end, May 1983. Halfway there, however, the company lost ground.

The general economy had a lot to do with the slowdown in business, as did the coming of micros, which has hit many processing companies very hard. National has been hitting back with its program of developing microcomputer systems designed to link small and medium-sized businesses and home computers into a bank's network of services. These Cash and Credit Management Systems have been the major source of revenue for National Data, and the company is hoping that the micro connection will bring back the profits.

In another important market, NDC introduced the first of the new generation of pharmacy computer systems. NDC's newest product is unique in that it provides the benefits of both standalone and on-line systems and technology. The new product can also interface with NDC's network of cash management and credit card services to provide pharmacies with unmatched payment authorization.

81

NBI INC.

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(303) 938-2795

NBI Inc. had a big growth year in 1982, with revenues climbing 56% to $119.6 million from $76.7 million and profits up 44% to $13 million from $9 million.

The office systems manufacturer underwent a management reorganization early last year that decentralized authority and decision-making and streamlined operating functions. Founded in 1973, the company today has 1,667 employees (up from 1,349 in 1981) and 166 sales and service locations in 16 countries.

NBI's success stems from a family of word and information processing systems, including the Docuwriter and OASys (Office Automation System) series. The Docuwriter, NBI's lower-priced system designed to simplify the production of documents used in many office environments, is upgradeable to the more sophisticated OASys line. NBI users can expand from entry-level systems to clusters to networks linking workstations, peripherals, and storage devices—all without discarding existing equipment or retraining. The Colorado company stresses the upgradeability and compatibility of its systems, claiming that this migration path protects customers against obsolescence.

The OASys 3000 and 3000S can be operated as standalone systems or can be connected as workstations to larger shared resource systems. NBI's shared resource products, the OASys 8 series and the OASys 64 series, serve the needs of offices that require more storage or shared storage available to multiple operators.

NBI also produces software packages for its systems that provide the information processing capabilities most needed in the office, including statistical math, equations, records processing, forms processing, and personal computing. In 1982, the company more than doubled its R&D expenditures from $3 million to $6.2 million.

Since its initial $12 million common stock offering in December 1979 (600,500 shares at $20 per share), the company's stock has done well, trading at 68½ at the time of a three-for-one stock split in February 1981. Last year it went from 31½ in January to 37 in December.

Early this year, NBI announced two 3270 communications products that will make it possible for its OASys products to communicate interactively with IBM mainframes by emulating IBM's 3270 products.

82

BRADFORD NATIONAL CORP.

67 Broad Street
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Problems still plagued Bradford National in 1982. The troubles began when the company went on a diversification binge into the health care services and the insurance business. Neither move was particularly profitable, but both were very costly to get out of. Bradford started to climb out in 1981 by selling some of the health care services, and took a $10 million loss for that year. Again in 1982, however, the health services were still haunting Bradford, and the company had to charge $496,000 against earnings. The sale of its insurance subsidiary produced a loss in 1982 of $578,000. These losses caused earnings to drop to $408,000 or 10 cents a share, not good, but better than the $10 million loss reported for 1981.

But while the results look bad, Bradford is actually in much better shape than the numbers show. Returning to its core business of supplying services to the investment community, Bradford has made considerable headway. The company is the leading independent bond clearing agent and now serves more than 300 broker-dealers and banks as well as all the major underwriting firms.

Another area where Bradford is excelling is the Securities Custody and recordkeeping business. Bradford now has over 3,000 publicly held companies as customers for this service.

In January 1983, Bradford president James L. Mann resigned for personal reasons, and the company appointed Roy B. Simpson as his successor. Simpson had been a senior vice president at American Can before moving to Bradford in 1981. The company he took over was finally free from its diversification nightmare and ready for clear sailing.

83

RECOGNITION EQUIPMENT INC.

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Irving, TX 75061
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REI had its worst year in history during 1982, with a 15% decline in revenues and a net loss of $10 million. The picture at year-end, Jan. 31, 1983, showed sales had slid to $110.9 million from the $126.1 million of 1981. Total corporate losses improved slightly, from a $14.9 million loss in 1981 to a $9.6 million loss in 1982.

On the management front, William Moore was named president and chief executive officer in March '82. Moore, previously with Perkin-Elmer, moved quickly to bring in other new blood. In April he lured George O'Brien away from P-E to become REI's chief financial officer, and in May he enticed Robert Reedy to leave IBM for the marketing vp post at Recognition Equipment.

The new management moved on all fronts. The number of employees was reduced by 30% to 1,924. Inventories were reduced, as well as short-term borrowings by 33%. And product lines were thinned to meet current demand. Management's gamble was that a return to the company's core business would also result in a return to profitability—and early indications signaled success.

What's ahead? The best indication comes from Moore himself: "There must be improvement of profit margins by concentrating our efforts in selling a higher volume of standard products as opposed to the higher priced but one-time specials. In the past the company tended to be a high-technology job shop, preventing it from spreading the substantial research and development investment over large product runs to produce acceptable unit margins."

With that in mind, we can expect REI to stay the course in data acquisition and document handling equipment.

84

GERBER SCIENTIFIC INC.

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The bad economic news in the rest of the world made it an unpleasant year for Gerber. It sold more, but made less. Total dp revenues increased 5.2%, to $107.2 million in 1982 from $101.9 million in 1981. Overall corporate revenues picked up very slightly, to

$115.8 million from 1981's $115.6 million.

The increase in revenues did not show up as profit, however. Corporate earnings declined 25%, to $3.5 million last year from $4.7 million in 1981. Earnings per share fared equally poorly, falling 26%, to 55 cents per share from 75 cents per share. Employees felt the pinch as well, as their total decreased to 1,300 from 1,700.

The difficult worldwide economic conditions severely affected Gerber. The sales increase, the result of expansion of the company's products and customer base, was negated by strong competitive pricing in the marketplace for turnkey interactive graphic systems and pattern grading and marker making systems. Expected order entries were reduced for Gerbercutters, the major product of Gerber's wholly owned Gerber Garment Technology (GGT). GGT is the world leader in the development of automated systems for cutting, pattern grading, and marker making for the apparel, aerospace, and automotive industries.

Most severely damaged by the recession was Gerber Systems Technology (GST), the company's 80%-owned subsidiary. GST was pounded by the recession for the first five months of 1982. The company responded with a series of changes in GST's structure and reduced its personnel significantly. Positive results ensued almost immediately, as GST posted two consecutive profitable quarters in the latter half of the year. GST also adopted a more aggressive posture in the computer aided design and manufacturing (CAD/CAM) markets overseas. As part of this thrust, GST introduced a high resolution color raster graphic workstation, a PC-800 model 3 with advanced color graphics, a laser-directed photoplotter, and a printed circuit board photoplotter.

Gerber remains convinced the bad news will become good news very shortly.

85

COMMERCE CLEARING HOUSE INC.

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CCH's data processing operation, which pulled in a little more than one third of the company's total revenues in 1982, suffered from a sluggish performance during the last calendar year. While dp revenues were up 36.6% in 1981, the growth rate shrank to 13.7% last year on sales of $104.5 million at the Chicago-based publisher of tax and business law periodicals. Overall revenues, which jumped 23% in 1981, rose only 12% to $350.1 million last year.

Among the company's key dp subsidiaries are CCH Computax Inc. and CCH Computax Systems Inc. CCH Computax provides computer processing of income tax returns. (The Multi-Tax Division also offers on-line tax compliance processing and planning services to professional tax return preparers such as accountants and lawyers.) The bulk of CCH Computax's revenues are accumulated during the first half of the year, when income tax processing work is at its peak. During this period, sales totaled approximately $76 million, compared to $65 million in 1981. Overall processing service revenues were up to $92.9 million, about 21% from $77 million in 1981.

Things were not as rosy at the publishing company's other dp offshoot, CCH Computax Systems. This operation, which continued its plunge deeper into the red in 1982, provides accountants with minicomputer and microcomputer hardware, software, and supplies. Mini sales sagged from $9 million in 1981 to $3.3 million last year. Software revenue was also down, but not as much, falling to $4.9 million in '82 from $5.8 million in '81. Meanwhile, micros, which were not in the sales picture at all two years ago, pulled in $3.4 million in revenue.

CCH hopes to turn this operation around in the near future. It also hopes to capitalize on Automatic Data Processing's computerized tax processing business, which it took over last year.

86

MANAGEMENT SCIENCE AMERICA INC.

3445 Peachtree Road N.E
Atlanta, GA 30326
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Ever since MSA made that "peachy" acquisition back in 1981, the company has had a different look. From a small, privately held firm that sold software strictly for mainframe computers, MSA has grown into a $100 million-plus public company that offers not only software for mainframes and micros but also software that ties the two extremes together.

In MSA's history, 1982 will go down as the year the company broke the $100 million mark in revenues. Sales climbed 38% to $101.2 million from the previous year's $73.1 million. Earnings were up an impressive 63%, soaring from $5.5 million (41 cents a share) in 1981 to $9 million (62 cents a share) last year. Such results didn't go unnoticed on Wall Street either. MSA's stock rose from a January opening of 11¼ to a December closing of 19¼.

Interestingly, MSA's healthy bottom line was achieved in ways other than what proved to be industry norms last year—employee cutbacks and reduced R&D spending. To the contrary, MSA upped its work force 34.5% to 1,348 employees and increased its R&D expenditures 33% to $21.8 million. And in a year when many dp companies saw overseas sales slip below year-earlier levels, MSA witnessed a 5% boost in foreign sales, which topped $23.7 million or 23% of total sales.

MSA's Peachtree Software acquisition has proved the catalyst for much of the change. Now, almost everything is coming up peaches. Last August MSA announced that its micro/mainframe dream had come true—it had combined the power of the mainframe with the convenience of the micro. This January it began delivery of the door to this interface—Executive Peachpak, a set of micro products for color graphics, financial modeling, word processing, and communications with other micros. The key to this door is PeachLink, micro software that allows selection and data capture from any MSA on-line screen for subsequent use with other applications in the Executive Peachpak.

The micro's effect on the mainframe is almost like the fable of the mouse rescuing the lion by gnawing through the ropes that bound it. And the desired effect of the micro/mainframe integration on MSA is clear: the company wants customers to consider it the one source for software.

87

VERBATIM CORPORATION

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Sunnyvale, CA 94086
(408) 245-4400

Lucky 13! That's how Verbatim viewed last year's performance. In the fiercely competitive and fast-growing market for flexible disks, Verbatim stands tall. Competing against such market heavyweights as IBM, 3M, Memorex, and BASF, this California company has managed in a mere 13 years to capture almost a quarter of the market.

In a year when the industry lid was lowered on company growth rates, squeezing profit margins and reducing the number of employees assigned any given job, Verbatim proved an exception. Sales soared 43.7% in calendar '82 to $98.6 million from the year earlier's $68.6 million. Net income increased tenfold to $11.5 million ($1.10 per share) from $1.1 million (45 cents per share), during the same time when R&D spending catapulted to $6.7 million from the 1981 total of $2.1 million. And the work force was expanded 20.4% from 1,487 people in '81 to 1,790 strong by year-end '82.

As often happens to a company such as Verbatim that generates over 50% of total revenues from oem sales, a sometimes competitor emerged as a somewhat compadre. In the fourth calendar quarter, Verbatim reached agreement in principle with IBM to establish a cross-license to share flexible disk technology. This agreement resulted in a $619,000 reduction in cost of sales for amounts previously expensed but not paid.

Back in 1981, Verbatim began investing in major production automation projects to allow it to continue meeting the growing worldwide demand for flexible disks through increased production capacity. These productivity improvements contributed significantly to an increase in gross margin to 41% and 47% of net sales, respectively, during fiscal '82 (ended July 2) and the first half of fiscal '83, as compared to 28% and 39% for the prior comparable periods. And for a total market estimated to grow at a compounded annual rate of 35%, such results are far from shabby.

Verbatim's success is built on the continued introduction of new products as well as the ever-enhanced reliability and durability of established product lines. The first half of '82 marked the introduction of the Datalife brand of flexible disks to the European market. For the first time in Verbatim's history, the company advertised in languages other than English. (The company derived about 31% of '82 revenues from foreign sales.)

At 1982's National Computer Conference, Verbatim announced a new generation of high-density flexible disks, the HDX series. Initial volume orders from oems confirmed the product line's success. Then in the third calendar quarter, Verbatim announced two new brands of flexible disks—the Verex and the Optima Series, with Verex representing the lowest-priced line and Optima the highest. In addition to new durability standards, the Optima products feature a reinforced hub, high temperature capability, precision recording performance, and reusable packaging.

In keeping with its market leader objectives, Verbatim chairs the Microfloppy Industry Standards Committee, a worldwide group of 20 companies that is coordinating efforts to establish an industry standard for the new 3½-inch disk—a market in which Verbatim is bent on being the leader.

88

TELEVIDEO SYSTEMS INC.

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TeleVideo Systems has come a long way since introducing its first product—a video game monitor—back in 1977, when its revenue was just under $1 million. Corporate revenues vaulted to $98.5 million in calendar '82, a 175% increase that made it third on our Gainers table. The fiscal year (ending Oct. 31, 1982) figures were even more impressive, with year-end sales surging nearly 300% to $101.7 million.

TeleVideo, which makes its debut in the DATAMATION 100 this year, produces non-IBM compatible crt terminals and CP/M-based microcomputers. It also sells supporting applications software and add-on peripherals. Last year, the company's terminal and peripheral sales were up 79.4% to $61.2 million over the prior year. Meanwhile, micro revenues went through the roof, skyrocketing 2,094.1% to $37.3 million.

The company's burgeoning business reflects the boom in the micro market—a market that seems to recognize no national boundaries. About 35% of TeleVideo's 1982 revenues come from outside the U.S., which proves that the micro movement has indeed become global.

Homing in on the market between personal computers and minicomputers, TeleVideo has concentrated on beefing up the micro—a move other microcomputer vendors have also made. And like other manufacturers, the firm has stressed multi- or shared-user configurations for the professional and business customer. The company considers its main micro rivals to be IBM, Digital Equipment, Convergent Technologies, Altos Computer Systems, and Apple.

To help combat such competition, TeleVideo relies on its sales force. The company, which sells through independent distributors, also markets its gear to oems and system houses. For maintenance, the firm depends on GE's Instrumentation & Communication Equipment Service Center to service its crts and on TRW for its small business micros.

Last year the company took the wraps off two 8-bit and two 16-bit small business micros. Other products are in the works as attested to by the company's R&D spending, which rose 153% to $2.7 million in 1982. During fiscal '83 TeleVideo plans to start volume production of five new micros and one new terminal. A new printer for use with the company's products is also under development.

A privately held company with less than 10% outside ownership, TeleVideo pulled in a remarkable 953% increase in profits during 1982. The company has high hopes of stretching that $12.7 million net to new heights this year, and will be aided with development capital from its initial public offering this spring.

89

CONVERGENT TECHNOLOGIES INC.

2500 Augustine Drive
Santa Clara, CA 95051
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Convergent Technologies enjoyed a spectacular year of tremendous growth, as the company's revenues soared 636.6% to $96.5 million from $13.1 million. This growth record made Convergent the biggest gainer on the Gainers table. Earnings were still more impressive, a 1,387% increase to $11.9 million from $800,000. The company, which was founded in August 1979 with $2.5 million in venture capital, went public in May 1982 with an initial offering of 4.4 million shares of stock.

One major reason for the company's sudden success is the Burroughs B20 small business system, which is manufactured by Convergent. Burroughs alone accounted for 48% of the company's 1982 revenue. Other long-term oem agreements have been concluded with NCR, Thomson-CSF, and C-3 Inc. As these and other oems join the 100-plus customers Convergent already has, the disproportionate influence Burroughs has on the company is expected to diminish.

Convergent established itself by manufacturing clustered, multifunction workstations. The workstations are designed as oem building blocks; they are totally modular and have multiple upgrade paths. Thus, a standalone system can be upgraded to a node in a local network with no software modifications; up to 16 workstations can be combined in a distributed intelligence network. Each workstation uses the CTOS operating system and supports five languages and various communications protocols. The product line now is divided into two families: the low-end application workstation (AWS) and the high-end integrated workstation (IWS).

The company has had to up its work force to 450 employees from 90 to keep up with the accelerating demands made by the company's fast growth. In addition, manufacturing and storage space was tripled in 1982 to 90,000 square feet.

The company effected a three-for-two stock split on Dec. 31, 1982, and plans to introduce a wide range of new products in 1983. Among those are the already announced SNA support; electronic mail; and the CP/M, MS/DOS, and Xenix operating systems support.

90

MODULAR COMPUTER SYSTEMS, INC.

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Modcomp's profits have been limping along for the past couple of years, but at least they limped upward in 1982. The past few years have been tough for this supermini maker. And, as the result of an order slowdown at the end of '82, Modcomp will probably continue to have difficulty maintaining its earnings upswing during '83.

Earnings were up in 1982 by 50% over the previous year, to $1.8 million, but from a very low base of $1.2 million. Earnings per share reflected a similar increase, rising to 34 cents in '82 from 22 cents, a 54.5% jump. Modcomp's revenues took a 6.4% change for the better, moving to $92.8 million in 1982 from $87.2 million in 1981. Minicomputer revenues from the Modcomp and Classic series rose 5.8%, to $72.8 million in '82 from $68.8 million in '81. Maintenance and repair revenues accounted for the balance of $20 million (up 8.6% over the $18.4 million in '81).

Modcomp minis are used by a variety of customers: NASA uses them as part of the launch processing system for the space shuttle; Avis uses them to keep track of check-ins, checkouts, and reservations; and even the Dallas-Fort Worth airport's driverless, computerized "people movers" that shuttle passengers between airport buildings are run by Modcomp's minis. The systems are usually sold rather than leased, and are priced at $50,000 to $150,000 each.

No doubt the mini's segment of the dp world is becoming smaller as micros and mainframes continue to squeeze it from both sides. Modcomp seems to be branching out a bit to strengthen its hold. Earlier this year, the company entered an agreement with Telcon

Industries Inc. to begin manufacture of Telcon's Zorba personal computer.

91

FLOATING POINT SYSTEMS

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(503) 641-3151

In a down year for many high-tech companies, Floating Point performed swimmingly. The company enhanced its position as a leading manufacturer of array processors. These are special purpose computers that perform complex mathematical calculations at high speed for what the company advertises as a low cost. Array processors receive information from a host mini or mainframe, perform the calculations faster than 100 Einsteins, and return the results to the host computer.

Demand for array processors clearly exceeds supply. Floating Point seemed to set records last year every time it crunched a number. Revenues rose to $89 million from $64 million, a 39% increase. Best of all, profits were up 49%, to $11.3 million from $7.6 million. All this money coming in allowed Floating Point to increase its R&D expenditures 11%, far less than the 92% increase in 1981 but enough to develop three major enhancements to its FPS-164, introduced in late '81 but fully produced last year.

Floating Point's products had nearly a 50/50 oem–end user balance for the company's first 10 years. Courtesy of the FPS-100, which is aimed at the oem market, oem sales rose to 54% of total revenue. The balance is expected to swing back, however, with the advent of the FPS-164, which is targeted toward end users.

Floating Point's main oem market and largest single contributor to the company's financial success is X-ray tomography, AKA CAT (computerized axial tomography) scanning. This market accounted for 40% of 1982 sales and is expected to increase this year. One reason for the expected increase is that Floating Point has another business that's on the downswing. The company's other major market, the seismic industry, experienced serious weakness in the latter half of 1982. There are no major seismic booms forecast for the first half of 1983, which indicates that Floating Point will sink somewhat during that period. Increased deliveries of the FPS-164 are expected to partially offset the seismic downturn.

But by year's end, Floating Point expects to be riding high in the water again.

92

MANNESMANN-TALLY

8301 South 180th Street
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Mannesmann-Tally, producer of both serial and line printers for micro- and minicomputer systems, boosted its total 1982 revenues to $125.5 million. With $37.5 million of that total representing internal sales, the company's dp revenues, on which its DATAMATION 100 ranking is based, grew by 12.2% to $87.5 million from $78 million.

The company—formed in 1979 when West German Mannesmann A.G., a maker of serial printers, acquired Tally, a U.S. line printer firm—grew in '82 by 100 employees to 1,600.

In June of '82 the company introduced a new multipurpose line printer family with speeds of 300, 600, and 900 lpm which, it says, offers the applications versatility of correspondence-quality printing, bar code, OCR, and special symbol printing. Called the MT 600, the printer can be used for word processing and for high-resolution graphics output.

In July Mannesmann-Tally joined the support group initiated by Intel, DEC, and Tektronix for the adoption of ANSI graphics standards, NAPLPS, and VDI, and began to take a more active role in the X3 (computers and information processing) Standards Committee effort.

A company spokesman said at the time that a graphics standard would allow peripherals manufacturers to deal with a common language and interface and thus they could develop products that would be compatible with off-the-shelf software packages.

In October the company introduced the MT 160 dot matrix printer for microcomputers, which offers dot addressable graphics, permitting a user to produce bar charts, pie charts, curves, or other images created on a video screen.

The 80-column impact printer features a high-density 40 × 18 matrix character printed at 40cps. In a data processing mode it uses a 9 × 7 matrix character for 160cps. It is compatible with all popular makes of microcomputers.

The company gets financial backing, managerial direction, and serial printer products from its West German parent.

93

GENERAL AUTOMATION INC.

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(714) 778-4800

General Automation is still on that long hunt for a turnaround begun when Leonard N. Mackenzie took over as chairman, president, and chief executive officer back in May 1980.

It didn't end in 1982. The company's sales dropped 27% to $84.1 million from $115.6 million. Employment was trimmed from 1,830 to 1,428. It lost $4.9 million for the year compared to earnings of $100,000 in 1981 and its loss per share was $1.90 compared to earnings per share of 5 cents.

GA has sold off its Lamination Technology Inc. subsidiary, which provided multilayer materials for printed circuit fabrication. More recently it sold a 9.3-acre parcel of land with a 108,000-sq.-ft. building that formerly housed its headquarters and a 10.6-acre parcel with a 130,000-sq.-ft. building that it is leasing back for its administrative offices.

High hopes for its new family of minicomputers, called the Series 900, which was introduced in April 1982, were dashed as sales proved slow. The Series 900 is priced 12% below GA's 16/200 and 16/400 Solution Series processors and is designed for industrial, communication, process control, and commercial applications. It will run under Unix System III as well as the company's own Control operating system.

The firm has termed "satisfactory" the customer interest generated by its latest announced offering, GA's first microcomputer line, named Zebra. And the company is optimistic about a machine it is building called Vulture, which will run under the Pick operating system and will attach to any Pick-based machine to increase its speed. Designed by the operating system's author, Dick Pick, it is touted as being able to turn a micro into a full 12-bit virtual machine.

GA will support Zebras and Vultures with its existing network of sales and service facilities and is negotiating with potential new distributors. The firm has seven sales and 60 service facilities in the U.S., plus sales and service locations in 42 other countries.

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ANACOMP INC.

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(317) 844-9666

Wheeler-dealer Anacomp made its way back into the DATAMATION 100 with a 50.9% surge in dp revenues to $82.4 million from the previous year's $54.6 million. Total revenues for the Indiana-based provider of computer and data center services increased 37.5% to $150.8 million from the $109.6 million recorded in calendar 1981. The profit picture, however, was not as pleasing. Net income was down 29.1% to $6.1 million in '82 from $8.6 million in '81. But what really hurt Anacomp in '82 was that much of its wheeling and dealing soured some investors in the company.

Anacomp is notorious for sponsoring R&D partnerships, and partnerships in which the company's own executives often invest. Then, a few years after a product is well on its way to market, Anacomp buys out the partnership—and at a nice profit for its involved execs.

Meanwhile, the company keeps its R&D spending to a minimum. A case in point came last June when Anacomp purchased for $16 million a new software system called CIS (Continuous Integrated System), developed by Anacomp for RTS Associates, a limited partnership formed in 1979. When RTS sold out to Anacomp, the executives' $567,000 cash stake in the partnership turned into a $2.9 million return.

Amidst cries of "conflict of interest" from analysts and investors alike, Anacomp retorted that this and all similar deals had been "clean, arms-length transactions." Nonetheless, the company's credibility took a beating with analysts as they questioned whether the partners' presumably risky investments, for which they got tax deductions, had really involved any risk, since some of the executives/investors held the key to Anacomps's decision to buy them all out at a gain. Meanwhile, Anacomp was doing well with CIS; by last September, the company had contracts to license out CIS for $11 million in fees.

Another partnership was dissolved in June as well, when Anacomp purchased for $2.3 million BANKSERV 10000, a system to provide banks with a new level of electronic transaction switching and processing capabilities. Anacomp had also developed that software system from an investment partnership.

Despite some shareholder pleas to the contrary, the company continued to bank on these R&D deals. In the third calendar quarter, funding for another partnership was completed with the closing of the final portion of $26.25 million in partnership interests. The partnership will contract with Anacomp to develop CIBS (Corporate International Banking System), a software system for use by large banks and other financial institutions engaged in international business.

Perhaps the intricate workings of these R&D partnerships would have escaped the critical eye of Wall Street had it not been for Anacomp's noted and noticeable successes. Apart from its steadily rising revenues, visibility was further increased with its first-time listing last April on the New York Stock Exchange. And with a surge in stature comes a surge in scrutiny.

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SCI SYSTEMS, INC.
5000 Technology Drive
Huntsville, AL 35805
(205) 882-4800

SCI Systems is not exactly a household word, but approximately 41.4% of its 1982 dp sales (up from 18.7% in 1981) came from none other than Big Blue. Dp revenues rose from $15 million in '81 to a high of $80 million in '82, mostly because of its slice of the IBM pie. SCI assembles the electronic circuit boards for IBM's P.C., and due in part to this somewhat symbiotic relationship, the company has joined the ranks of the DATAMATION 100 and become number two on our Gainers table. Its total corporate revenue was up from $67.6 million in 1981 to $133 million in 1982.

This company was founded in 1961 as an engineering firm with NASA as its prime contractor and customer. SCI's earliest efforts were subsystems for the Saturn-Apollo program, which then expanded into NASA's satellite programs, followed by military missile and satellite programs. SCI's present military aircraft business evolved from its space program activities. Among other government contracts, SCI works on MX missile guidance computer memories, the F-16 aircraft management computer, an acoustic data processor for the P-3C aircraft, and several military satellite applications.

Although many firms experienced layoffs and reduced profits during this recessionary period, SCI added 835 employees and watched its profits rise from $3.3 million in '81 to $5 million in '82. Earnings per share also reflected a good year for SCI, reaching $1.13 compared with 84 cents in 1981.

The government is currently SCI's second largest customer. Because the company does a lot of work for the Defense Department, details on R&D and dp segment revenues are kept secret and were not available for this survey.

In addition to government contracts, SCI announced in June '82 an agreement with one IBM division that may offer up to $158 million in sales through December '83.

The future looks positive for SCI. The firm is expanding its facilities to "accommodate continued revenue growth." According to chairman Olin B. King, emphasis during 1983 "will be placed upon successfully translating a large order backlog [$318.7 million in '82] into substantially higher sales and earnings in a difficult economic climate."

96
COMSHARE INC.
3001 South State Street
Ann Arbor, MI 48104
(313) 994-4800

The entire services industry has been wrestling with the onslaught of micros, and some of these companies have been more successful than others at holding their own. Comshare, however, has been pinned to the mat for the past two years, and the company claims it's a direct result of those micro heavyweights.

During 1982 Comshare's revenues dropped 4% to $78.6 million, while earnings (from continuing operations) fell to a mere $825,000 from $4.4 million a year earlier.

Not to be out of the contest, Comshare has made various stabs at a comeback for two years running. In 1981 the company sold a portion of its income tax preparation operation, and the rest of that group was sold in 1982. The company also bared plans last year to discontinue its Trust Management Systems, a minicomputer-based accounting system for bank trust departments. Comshare indicated this phase-out would take about a year.

Besides getting rid of marginal operations, another of Comshare's strategies has been the realigning of its staff. The research and sales departments have been beefed up, while the rest of the company has been pared down. Research and development costs have been padded for the past two years, and hit $7 million in 1982.

These R&D efforts brought some additional product punch to 1982. Planner Calc was released to compete with similar novice business planning systems, and it is upgradeable to a professional modeling system called Target Financial Modeling, also introduced last year. Comshare's master plan is to gain a strong foothold in the market for personal computer software by keeping prices low and by integrating these products into the broader decision support framework, including linkage to large mainframe systems.

For its traditional timesharing clients, Comshare is now producing a version of each of its principal timesharing products for clients' in-house use. The first in-house version will be System W, a high-powered financial modeling package for IBM machines. The company is hopeful that this shift in direction will help it regain some of its former financial muscle.

97
MICOM SYSTEMS INC.
20151 Nordhoff Street
Chatsworth, CA 91311
(213) 998-8844

A newcomer to DATAMATION's Top 100 this year, Micom Systems Inc. had revenues of $78 million in 1982, up 49.1% over $52.3 million for 1981.

Profits for 1982 were up a whopping 69.8% from $7.3 million to $12.4 million. Per-share earnings went from $1.06 to $1.70. Organized in 1973, Micom made its first stock offering on June 19, 1981. Opening price for stock in January 1982 was 28½; closing price at year-end was 49¾.

Considered the dominant supplier of low-end statistical multiplexors, Micom, with more than 50,000 installed systems, continues to experience growth in all of its product and market sectors. Its fastest growing product is its Micro600 Port Selector, which represents about 17% of revenues and is growing at an 80% rate. The company has an installed base of 700 of these devices, which stands at the heart of a long-term strategy to penetrate the low end of the local area network (LAN) market.

Micom grew 40% in number of employees in 1982 from 652 to 915. Research and development expenditures were up 71.8% from $3.2 million to $5.5 million.

During the final quarter of calendar 1982, the company introduced a number of new products including the Instalink469 data/voice multiplexor, the second in a series of "Insta" products for LANs. This lets data and voice share twisted-wire pairs and can be installed with existing phone installations.

Micom is identified in the data communications industry with its "fruity" advertisements. It all started with oranges. When the company introduced its Micro800 Data

Concentrator in 1977, it advertised this product by asking the question, "Still squeezing data the old-fashioned way?" The answer was illustrated with an orange juice can: "Concentrate. It's cheaper."

98

PRINTRONIX INC.

17500 Cartwright Road
Irvine, CA 92713
(714) 549-7700

Despite the 1982 slowdown of oem sales in general, Printronix came through with increased sales and earnings. The printer manufacturer, which garners about 60% of its revenues from the oem market, saw sales climb 28.7% to $77.4 million. Earnings increased 12.2% to $5.5 million from the $4.9 million of a year earlier.

Printronix didn't pin all its hopes on existing products to pull it through a tough year. The California company came out with a new printer, the MVP, that diversified it from the minicomputer market into the small business system and office automation marketplace. Smaller, quieter, and cheaper than Printronix's classic models, the MVP produces dp output at 150 lpm, wp at 80 lpm, and compressed print at 200 lpm. Initial orders were strong, and the company indicated it would increase production facilities this year.

By midyear, another new product hit the street—a graphics processor that can transform any Printronix printer into a graphics printer. Early orders indicated this too would be a promising product during 1983.

Expectations for an even stronger 1983 were raised when Printronix announced in early '83 its acquisition of Data Printers, the Massachusetts-based printer maker. A privately held company, Data Printers had 1981 sales of about $35 million. This acquisition will no doubt push Printronix over the $100 million mark in revenues for 1983.

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SCHLUMBERGER, LIMITED

277 Park Avenue
New York, NY 10172
(212) 350-9400

What does it really matter that Schlumberger's $6.3 billion in revenue in 1982 represents a 5% increase over 1981, or that its profits climbed 6% to $1.3 billion? Schlumberger's four entries in the data processing market—Applicon, Manufacturing Data Systems Inc. (MDSI), Benson, and Rixon—together are barely a drop in the oil giant's bucket. The problem is that Schlumberger does not publish detailed information on the many individual drops in its bucket, so no figures are available concerning divisional profits, R&D, revenues, employees, etc. The figures in the Top 100 table represent DATAMATION estimates for Applicon only—although Applicon and MDSI are grouped together within Schlumberger as the Computer Aided Systems division.

Applicon is the largest of the four, with revenues in 1982 of $76.2 million. (This excludes $19 million in internal revenues.) Although sales dropped some 2% in the U.S. in 1982, a 39% gain in international sales was sufficient to raise Applicon's revenues 14% over 1981. Applicon introduced the Series 4000 modular CAD/CAM system in the second quarter. The 32-bit system is composed of compatible hardware and software modules that can be configured to meet many users' requirements and be upgraded later in the field. Users can implement communications between Series 4000 systems so that design and manufacturing operations can share information. DATAMATION estimates that R&D within Applicon leading up to the Series 4000 and future products amounted to 14% of its total sales, or $13 million.

MDSI also introduced new products in 1982. The N/C Graphics system permits users to describe part shapes and tool motions graphically using a color display screen, reducing the time and complexity involved in producing N/C tapes.

Benson, a privately held company acquired in October, recorded an increase in its sales of pen and electrostatic plotters, as several new products were added to its line. Rixon's revenues declined owing to strong competition in the high-speed modem market.

Schlumberger's motives in acquiring these companies—three in the last two years—seem to be geared more to improving in-house capabilities than to developing new markets aggressively. But the acquisitions may give the company a stronger base from which to pursue the market for collection and interpretation of industrial data.

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DECISION DATA COMPUTER CORP.

100 Witmer Road
Horsham, PA 19044
(215) 674-3300

This peripherals and service company's 1982 results were good enough to propel the firm into the DATAMATION 100 for the first time. Corporate revenues rose 48.3%, to $74.3 million from 1981's $50.1 million.

The company's core business—printers, controllers, data entry equipment, and a workstation for the IBM System/34-38 market—accounted for a good chunk of the improvement. Revenues in this area rose 62%, to $46.5 million from $28.7 million. The star performer was DDCC's crt workstation, first shipped in January 1981. The company delivered over 14,000 of these units in '82, nearly quadrupling the 1981 figure. DDCC also introduced three new products in 1982: a 300-line-per-minute matrix line printer, a line of high-speed band printers, and a communications controller permitting remote connection of up to nine of the company's workstations and/or printers to IBM hosts. Most DDCC products can also be interfaced with equipment from HP, DEC, and other manufacturers.

In addition to selling and leasing to end users, DDCC participates in the oem business in two ways: by selling to systems houses, and by configuring systems itself, most notably for the U.S. government.

The other major segment of the company is its maintenance business, which saw revenues grow 43% over the previous year to $22 million from $15.4 million. The growth resulted from DDCC's larger installed base of equipment and from its increased participation in the third-party service business. DDCC started servicing other manufacturers' equipment in 1980. In October 1981 it purchased the maintenance division of Atlanta-based Computer Usage Corp. In June of 1982, DDCC announced it had acquired the field service business of Ramada Inns Inc.'s International Micor Services Unit.

DDCC's total corporate profits in 1982 were $3.8 million, up 90% from 1981's $2 million.

"I'm telling you, Helen, there's something funny going on over there."

CARTOON BY STEVE ATTOE

The European microcomputer industry is fighting for a piece of its home markets.

THE MANIA FOR MICROS

by Malcolm Peltu

FIG. 1

PROJECTED SALES OF MICROCOMPUTERS UNDER $12,000 (1982-90)

	BUSINESS (including education)	HOME	TOTAL
FRANCE			
1982-85	494,920	359,960	854,880
1985-90	1,860,100	1,193,690	3,053,790
1982-90 (total)	2,355,020	1,553,650	3,908,670
WEST GERMANY			
1982-85	914,320	522,980	1,437,300
1985-90	2,730,300	1,719,900	4,450,200
1982-90 (total)	3,644,620	2,242,880	5,887,500
ITALY			
1982-85	303,950	205,360	509,310
1985-90	1,244,500	642,390	1,886,890
1982-90 (total)	1,548,450	847,750	2,396,200
U.K.			
1982-85	882,685	1,394,325	2,277,010
1985-90	2,255,200	948,890	3,204,090
1982-90 (total)	3,137,885	2,343,215	5,481,100

SOURCE PACTEL

Europe is in the grip of a fever—a frenzy of microcomputing that has turned the European continent into one of the fastest-growing markets for microcomputers in the world.

Last year the U.K. market doubled, the German market grew by around 130% and the French market erupted with an increase of over 250%, according to Paris-based researchers Intelligent Electronics.

Ironically, American manufacturers are making most of the killings, especially in the business sector. U.S. suppliers have taken swift advantage of the lack of homespun European competition since the microcomputer revolution really got under way in the late '70s, and are now well out in front on market share of business micros in every European community.

The irony is that the first microcomputer was designed and built in Europe back in 1973, when Steve Jobs was still a schoolboy. The machine, called the Micral, came out of a small French company, R2E, now a healthy subsidiary of Cii-Honeywell Bull, but at that time the European computer industry, the market, and the venture capitalists were just not ready. It is only now, 10 years later, that European manufacturers are making furious efforts to stem the U.S. tide.

Europeans, particularly in the U.K., soon realized that they could put a chip into a box and add a screen and printer as easily as their American counterparts. Some began as distributors for U.S. vendors during the 8-bit and more recent 16-bit microcomputer booms. They established a marketing network and are now building their own machines. A prime example is the Victor Technology Sirius distributor in the U.K., ACT, which is developing an Intel 8086-based portable microcomputer called Apricot primarily for Europe but which ACT hopes Victor will pick up for the U.S. market.

The large European manufacturers have also jumped on the bandwagon. Siemens announced microcomputer products at the Hannover Fair in April; Thomson in France is selling its own low-cost micro, the TO7, alongside its Fortune 32:16-based Micromega; ICL is using the U.K.-built Rair Black Box as its personal computer; Dutch electronics giant Philips sells its P3500 multiterminal system; and Italy's Olivetti is pitting itself against U.S. suppliers with its Linea Uno family of micros.

Microcomputer sales projections in Europe until the end of the decade (see Fig. 1) show that the potential market is now there in abundance. Yet it will still be an uphill struggle for the European industry. Both U.S. and Japanese companies are acutely aware of the limitations of their own home markets and see Europe as the ideal secondary target. European companies do not have that large home base to work from, yet face the same problems as foreign suppliers trying to sell machines across the Continent.

The European market's micro madness has reached this pitch despite significant obstacles inherent in its geographical and nationalistic diversity. Unlike the relatively cohesive markets in the U.S. or Japan, Europe is made up of many parts, and there are no easy answers for suppliers hoping to tap the whole market. One country's micro is another country's problem machine, especially on the software side.

IBM took 17 months to organize a pan-European launch of its Personal Computer after it was announced in the U.S. That was

EEC import duties on chips and electronic components make domestic production expensive.

partly due to bad production planning and partly because of the problems of nationalizing the hardware, software, documentation, and distribution networks for a simultaneous launch. Being IBM, it could not afford to upset any national market by launching the PC in one or two countries first. The delay was simply to achieve a market parity.

Europe, however, is in an advanced state of micro-mania and did not wait for IBM. The machine was shipped across the Atlantic by the crateful, to the U.K. in particular, during the 17-month period. The shipments came from U.S. dealers and were all unofficial. IBM could do nothing to stop them.

The U.K. was a prime target for the under-the-counter PCs because it is the most advanced market in Europe for both the use and supply of micros. Much of this lead has been built on low-cost home computers where, thanks to the U.K.'s micro guru Clive Sinclair, it dominates the supply of machines at this level. Indigenous manufacturers of business micros, however, are finding it as tough as other European suppliers to overcome the dominance of foreign vendors.

According to the British Microcomputer Manufacturers Group (BMMG), there are around 100 companies making micros in the U.K., 40 of which are locally owned. The group's vice chairman, Nigel Smith, who also heads U.K. micro company Modus Systems, asserts that "unless something is done very quickly to help British manufacturers win export markets, it will be difficult to overcome the current 85% to 95% penetration of the U.K. market by imported goods."

Smith adds: "It is difficult to produce anything cost-effectively with such a relatively small home market compared to the Americans and Japanese. Although the government has assisted information technology in many ways recently, British companies are still heavily discriminated against in terms of the duty on imported goods."

HEAVY LEVY ON CHIPS

Chips and electronic components imported into the EEC are currently subject to a 17% import levy; complete or partially built computers have only a 6% levy. The aim was to help nurture European chip makers, but so far there is little European chip supply to feed the hungry micro makers. "We must export to survive," says Smith, "but this discriminatory duty is merely helping to export jobs. It is cheaper to manufacture elsewhere."

The British government has risen to the criticism and in April began canvasing views from U.K. micro makers with the intention of proposing to the EEC that the duty on components be reduced to 11%. "It is a step in the right direction but we want it lower than that, down to 6% or 7% so that there is no penalty for manufacturing in Europe. That is what the woolly bureaucracy of the EEC has to realize," Smith asserts.

Both Smith and the BMMG's chairman David Broad agree, however, that the past openness of the U.K. to foreign competition has been a valuable stimulant to the U.K. market. This point was picked up by Roger Eden, general manager of Office International, the sole distributor of Japanese Toshiba micros in the U.K.

"The U.K. is probably the only country in the world with so many different suppliers. U.S. companies often make the U.K. their first export market. Japanese suppliers are also here alongside British manufacturers and other European companies. This creates greater pressure on users and greater awareness," comments Eden.

Broad adds that the British government has played an important role in increasing user awareness by "taking information technology to its heart" and designating 1982 Information Technology Year. That generated a great deal of publicity and media coverage encouraging the use of computers.

There have also been more direct measures like the state scheme to fund up to one third of the development costs on innovative projects. This is still lower than the 50% help given to Japanese companies by their government, but Broad admits that it has helped U.K. companies "to keep on the fast ramp of innovation. It has helped us to produce more products more quickly."

Broad also believes that a major factor in the relative success of the U.K. micro market is the availability of a "mature" dealer network and a large pool of skilled specialists. David Slinn, marketing manager for U.K. micro company Comart, says that both these factors owe a great deal to the presence of the U.K.'s long-standing—if recently limping—computer manufacturer, ICL.

"Many people involved in the micro business in the U.K. have come from ICL. If there had been no ICL, there would be no indigenous micro industry in Britain because there would not have been sufficient know-how and expertise around," commented Slinn. He adds that the dark clouds over ICL in the last 18 months as it struggled to reorganize itself have had a silver lining for the U.K. micro industry. "The recent layoffs at ICL," says Slinn, "have fueled micro distribution channels. It is amazing how many ex-ICL people used their redundancy payments to set up micro dealerships. These people understand the kinds of systems that represent the real growth areas of the future—multiuser networked sytems."

According to Mike Burden, chairman of Optim Computers, a U.K. micro company, "There are more dealers than bus stops" in the U.K. But, he warns, the U.K. market is "close to a shake-out." He feels that too many suppliers and dealers are competing for a slice of the same action. Eden agrees: "It needs a lot of clever development backed by broad resources to survive in such a tough market," he says. The companies that will survive in the long term are those that don't have all their eggs in the micro

A BRITISH MAVERICK.

With a personal fortune of over $18 million (£12 million), the U.K.'s microcomputer maker Clive Sinclair is one of the new breed of multimillionaires. Like Apple's Steve Jobs, Adam Osborne, and Commodore's Jack Tramiel, Sinclair is turning bytes into megabucks on the back of the mass market computer revolution.

He is a man of contradictions, a hard-nosed entrepreneur who delights in poetry, classical music, and radical novels. When he left school at 17 he deliberately avoided any further academic study, preferring to "live a little," as he says. Now, at 42, he is taking an economics degree at Cambridge and is chairman of the British Mensa—a club for people with high IQs.

His company, Sinclair Research, has sold over 1 million of its low-cost home computers, and he is ancient enough in the world of British microelectronics to be nicknamed "Uncle Clive." Yet he is not especially interested in computers. In the past he has tried calculators and failed with digital watches, and in the future he hopes to succeed with electric cars and miniature tv sets.

Even though his current success is built on common-sense technical realism, he is also a social dreamer, seeing the future as a high-tech utopia where employers are so generous that labor unions are unnecessary and most people spend their time running or visiting local Disneyland-style leisure parks.

Sinclair twists an American axiom to explain his business approach: "My highs come from doing for 10 pence what any fool can do for a pound," and he discounts his personal wealth as almost incidental. "Money is only a means to an end, not to make me wealthy but to make useful products that people might enjoy."

Apart from his own $18 million, he has an 85% stake in Sinclair Research that, based on a recent share transfer, is capitalized at over $200 million, with Sinclair himself as the main asset.

He set up his first company, Sinclair Radionics, at the age of 22, after a stint as a journalist on the magazine *Practical Wire-*

less. The company made radio and later hi-fi kits and he sold them mail order—a marketing technique that he has used consistently in his career.

In the early '70s Sinclair ventured further into consumer electronics with well-designed but generally unreliable calculators and digital watches. Here he learned some valuable lessons about the importance of getting the production right—or at least how to give the production to somebody else. The supply and quality problems, however, and some internal mismanagement in the face of growing Japanese competition got the company into deep trouble by 1976.

The British government came to the rescue. It pumped money into the company and was initially eager to see Sinclair's latest passion, the pocket tv, get on the market. But after a row over future product policy with the National Enterprise Board, which was managing the government's investment, Sinclair resigned in 1979. In July that year he set up Sinclair Research and a year later launched his first home computer, the ZX80, for the rock-bottom price of under $160 (£100).

He describes this machine as simply an interim model in the development cycle, but he felt he had to get into the market as quickly as possible to thwart any foreign rival. In 1981, with 100,000 ZX80 sales tucked into his wallet, he launched his real baby, the more powerful ZX81, which now retails for around $75. Last year he added the ZX Spectrum to the product range, which moved the company up from the educational-toy level to the same bracket as systems like the Commodore VIC 20.

Sinclair solved the production problems of his new company by contracting manufacture out to the multinational Timex group. There have been some difficulties and faults in Sinclair computers but nothing, as yet, that has had a real impact on the company's success. Timex also had a license to market Sinclair computers in the U.S. giving Sinclair a rake-off from U.S. sales without any of the production, marketing, or distribution hassles.

Apart from virtually creating a mass market for home computers in the U.K. and playing a major role in heightening the country's level of awareness and computer literacy, Sinclair has also inspired many similar entrepreneurial ventures. Some of these were started by former employees of Sinclair Research, others by newcomers who have jumped on the bandwagon that he set rolling.

Clive Sinclair with his Microvision pocket tv

Not everyone, however, is enamored of Sinclair. When the British Broadcasting Corporation decided to break its traditional impartial role by sponsoring its own computer, it turned to one of the Sinclair spin-offs, Acorn Computers. This angered normally mild-mannered Uncle Clive, who objected strongly that he was not given a fair chance by the BBC.

The U.K.'s Department of Industry also left him out of a government scheme to encourage schools to buy from a recommended list of microcomputers, despite the fact that Sinclair is the embodiment of the Tory party's entrepreneurial ethic and one of Mrs. Thatcher's industrial darlings. Not to be outdone, Sinclair introduced his own half-price promotion for schools, and finally the government relented and added the Spectrum micro to the list.

Even some financial analysts are wary of Sinclair. His company has a distinct smell of success about it at the moment, but the concern is over the long-term future of an operation that is heavily dependent on a single product line. Analysts also point to his past failures to show that his judgment is not infallible, and note that Japanese and American manufacturers are starting to eat into a market that for a couple of years he has dominated.

Sinclair, of course, is unworried and sufficiently self-confident to invest much of his own money in the development of his electric car, which he hopes to bring out next year. he also has a deal with his old buddy Robb Wilmot, managing director of ICL, for the joint development of a desktop workstation for ICL using Sinclair's flat screen technology. And there is the flat screen Microvision tv that Sinclair took with him to Sinclair Research, due out this year, and enhancements to the personal computer range. Sinclair is also developing a more professional system with integral microfloppy disks and a full-sized display screen.

Then there is the book. Sinclair's success in the U.K. computer business has given him a high public profile and he has taken to accepting media appearances, where he dabbles in social and economic punditry, especially about the age of high-tech living that is just around the corner. His views are often contentious, such as his belief in a national switch from "products of material to products of the mind" like video and computer services, where "there is little chance of employees being exploited by rapacious capitalists." This, he predicts, could lead to a "golden age, as fully intelligent machines appear, bringing immense new wealth." He is so fascinated by the future that he has started to write a book on the subject.

Sinclair is a British maverick, with a lot of kick left in him.

—Malcolm Peltu

basket. "Companies need to keep abreast of a variety of developments, such as screen technology, as well as of the mainstream microcomputer technology," he says, and the surviving companies will be those with a broad information technology base, as typified by Japanese electronics groups.

National schemes and marketing channels, however, have only achieved so much; many people point to one man as the real instigator of the British microcomputer boom—Clive Sinclair (see box).

Sinclair overcame two of the main problems facing business micro vendors—the limited size of the home market and the complex distribution channels that siphon off profits. Sinclair created his own market out of nothing by developing the first real consumer-level computer. In 1979 he brought out the ZX80 for the magical price of £99.95.

He had broken the psychological £100 barrier. American systems like the Apple and the Commodore Pet were too expensive for the average consumer. Since 1979 Sinclair has sold over 1 million of the ZX80and subsequent ZX81 and Spectrum systems, with around 70% of them for export.

He solved the distribution problem by starting out with mail order sales only. In this way he established a large home market on

By the end of last year, Germany was the second largest market for home systems in Europe.

his own terms and with the minimum of distribution costs. Once the Sinclair name was well known, he gradually switched to mass marketing channels through major chain stores.

The effect on the market was dramatic. Pactel's figures show that more home computers were installed in the U.K. by the end of last year than in the combined total of the other main European markets, West Germany, France, and Italy. In the use of microcomputers in business, however, the U.K. lead is less impressive. In fact, excluding systems under $1,000 from the Pactel figures on installed business machines (these low-end systems are mostly for education use), West Germany comes out on top.

Germany has its own rules about buying microcomputers. "It is different from the other European markets," explains Wolfgang Schaffer, head of Synelec, a microcomputer and peripherals company based in Munich. "It is much more business application driven. We do not yet have that hobby market mentality."

Pactel's survey, however, shows that by the end of last year Germany was the second largest market for home systems in Europe, with an installed base of over 92,000 units. This is well below the U.K.'s 575,000 but significantly in front of the 63,150 in France and the 38,250 in Italy.

Yet the business side of the industry is certainly dominant in Germany. Pactel records that the installed base by year-end 1982 was 223,680 units, close behind the U.K.'s 234,715 and well in front of France's 134,380 and Italy's 99,750. The growth of the home systems market in Germany is definitely on the back of the business market, rather than alongside it as in the U.K.

Indigenous manufacturers have responded accordingly. "There has been an obvious awakening of the German business microcomputer industry over the last few years," adds Sheaffer. Olympia, Triumph Adler, Nixdorf, and Siemens with its new PC 16 have recently entered the market. "There are now a tremendous number of small micro makers aiming at specific segments of the business market and turning over 100 to 200 units a year," says Sheaffer.

The German businessman, however, is a tough client to sell to. Brian Hardisty, head of Pactel's product and market planning division, commented that the solid and systematic approach of the German buyer is in stark contrast to the U.K. buyer's tendency to "buy first and think about what to use the micro for later." Allen Porter, European head of the Yankee Group research company agrees: "The Germans are bits and bytes people. They want to understand the details of the software and the hardware before they

U.K. BOARDS INTERNATIONAL SOFTWARE TRAIN

Software has become a symbol of national pride in Britain. "The jewel in the crown of British information technology" is how Information Technology minister Kenneth Baker described software.

A glance at the world software scene, however, indicates that, while there are many thriving British companies, American vendors dominate the package market. Warren Werblow, chief executive of British software and services company Scicon, recently pointed out that although the British software industry is always congratulating itself on how good it is, exports account for only about 5% of total sales. And a DATAMATION INTERNATIONAL survey in 1981 found only one British company in the European software and services top 15.

The traditional pattern of the U.K. software industry, however, has so far been particularly suitable for the microcomputer market—smaller companies, aiming at specialist markets atuned to current industry trends.

Peter Hewitt, marketing manager of one of the most successful British software companies, Micro Focus, also believes that Europeans have perceived more continuity between traditional mainframe/mini software and microcomputers. American micro buffs, he said, are often "neophiliacs"—lovers of the new.

"In America, the micro industry thought that its inventions had changed all the rules. It thought everything that had gone before was obsoleted. Europeans have taken a longer-term view." Micro Focus, for example, built its business on the supply of ANSI standard COBOL systems for micros. Another British company, MicroAPL, has exploited the popularity of IBM-oriented APL users.

British software (and hardware) developers do have one inherited advantage over other European countries: English is their native language. David Tebbutt, director of software publishers Caxton, explained: "Although micro software products retail at a much lower price than mainframe software, they require an equivalent large investment in development, testing, documentation, and marketing," he said. "At least British companies can move products to and from the U.S. market without a hefty investment in language translation."

Micro Focus has been the most successful British micro software company internationally. It was started in 1976 by three young men, Brian Reynolds, Paul O'Grady, and Stewart Lang. One of their first projects was to develop a COBOL compiler for the ICL 1500 minicomputer. The Micro Focus philosophy was to stick to ANSI standards. Its COBOL compilers, which now include a Level II COBOL of mainframe capability, have received certification from the U.S. government.

"The initial certification for CIS COBOL gave us a tremendous marketing boost," commented O'Grady, now president of Micro Focus Inc. "It was the first micro software to get such approval and showed that users could be confident in the quality of the product and its compatibility with existing investments in COBOL programs and expertise."

Hewitt explained that Micro Focus has done most of its business directly with manufacturers. "This gives us cash immediately and helps in providing worldwide distribution channels, without requiring too much of our own resources in establishing a dealer network."

About 65% of Micro Focus's business is outside Europe, with over 50% in the U.S. and 10% in Japan. Apple, Digital Research, BASF, Digital Equipment, IBM (in the U.K.), ICL, Intel, Canon, Hitachi, Siemens, Victor, Mitsubishi, Tandem, and Texas Instruments are among the impressive list of computer companies licensed to supply Micro Focus products.

In the software publishing business, Caxton has established two products, the Cardbox filing systems and Touch and Go keyboard training aid, which have sold over 3,000 copies. Osborne Computers supplies Cardbox on an oem basis as Portable Cardbox.

Tying up a deal with an American supplier has also been a spur to Precision Software. Commodore has picked up its word processing and spelling checking packages, Easyscript and Easyspell, and is marketing them under the names Superscript and Superspell.

MicroAPL is another U.K. venture started by a small team. In 1979, five APL users set up the company. It has developed a number of systems based on the Motorola 16-bit 68000 processor, including one using the Sage computer. "We were greatly helped by being able to use the Mirage operating system, developed by an independent company in the U.K. for the 68000. One of the real strengths of British software is having so many specialists in the country who are at the forefront of technological innovation and close to what is happening in the U.S.," said MicroAPL marketing director Robert Bittlestone. That is one resource the U.K. wants to keep to itself.

—M.P.

Europe does not have a tradition of enlightened risk finance as in the U.S.

buy, down to the last nut and bolt.''

That has not stopped them from signing on the dotted line and the German market looks set to grow faster than the U.K. over the next few years, according to Pactel.

FRANCE TRYING TO CATCH UP

France, meanwhile, is catching up with the market leaders by leaps and bounds, and like the other European countries is desperately trying to build up a domestic microcomputer industry to fend off the U.S. and Japanese threats to its home markets.

Among the French manufacturers, R2E is the strongest. It was set up back in 1971 by Truong Trong Thi, a Frenchman of Vietnamese descent who produced the world's first micro in 1973, the Micral. The machine still exists, at least an updated version of it does, but Truong has not made his fortune. He spent five years trying to muster the money to mass produce the machine but with limited success, and he began a gradual sellout to Cii-Honeywell Bull in 1978. Last Autumn he resigned as chairman of the company, leaving Cii with France's most promising microcomputer firm. Its turnover has soared from FF35 million in 1978, to FF200 million last year.

Although Cii entered the market five years ago, it still has not managed to break the stranglehold of U.S. producers in the business sector. According to researchers Intelligent Electronics, the Micral sits in fourth place on market share with an estimated 9% of the business market. It is soundly beaten by Apple with 23%, Commodore with 12%, and Tandy with 11%.

The rapid growth of the French market, however, could change all that. French companies are fighting hard to regain a fair share of the market. Thomson is trying a two-pronged attack with its Micromega 32 business system based on the Fortune machine, and its own micro family, the TO7. Logabax is concentrating its efforts on its LX 500 series, hoping to increase sales from the 3,000 units last year to 10,000 in 1983. Also in the running are Léonard, SMT Goupil, Symag, and Matra-Tandy.

The French government is slowly helping to stimulate the market. Much of its attention, however, is focused on the political initiative to reorganize the whole French computer and telecommunications industry. Microcomputers are just one item on a long list. The effort is beginning, though. As in the U.K. and elsewhere, the French are also aiming part of their efforts at future users. There are 10,000 microcomputers on their way to French schools, and, in an effort to better understand future market and social needs, the French government is pumping 1,000 micros into an area of Marseilles with a population of 17,000 to see what happens.

The French market is only just taking off, hence the inflated market growth of over 250%. The slow start may be due to the difficulties experienced by U.S. vendors in the early stages of the microcomputer boom as they converted products for the French market. That did not help stimulate French start-up companies, which had to contend with a limited market without sufficient sales potential to make production economical, a vicious circle that U.S. vendors later exploited.

The cost of a microcomputer in France is another problem. A Sinclair ZX81 only costs around $70 in the U.K., as opposed to more than $100 in France. ''U.K. prices have traditionally been hammered down,'' commented the BMMG's Nigel Smith. The BMMG calculates that U.K. prices are about 1.1 times that of the same system in the U.S. Other European countries suffer from price differentials of 1.2 to 1.4 times the U.S. equivalent. French tourists have even taken to including microcomputers in shopping sprees in the U.K.

LACK OF VENTURE MONEY

France also suffers from a lack of easy venture money. That is a significant problem for all of Europe, where there is no strong tradition of enlightened risk finance as in the U.S. Even in the U.K., where the industry is more developed and money is starting to flow into the microcomputer industry, there are still problems. The BMMG's David Broad comments that although there has been enough venture money around recently to set up a micro business, ''it is difficult to get sufficient long-term finance at a low enough interest rate to enable countries to expand into world markets.''

Economic realities have been a major limiting factor throughout Europe. Risk money has been scarce and each country's market is too small, except perhaps in low-cost home computers, to enable companies to build a strong domestic base from which to expand internationally. With over 50% of the world computer market, the U.S. is the prime export target for European countries, but, because of its broad geographical scope and the presence of so many U.S. suppliers, it is also the most difficult market to win from afar. Ask the Japanese.

Nigel Smith feels that the real potential in exporting micros from Europe lies in the development of the Third World countries where, through past colonial involvement, Europe stands a better chance than the Americans or the Japanese of winning high market shares. Other observers feel that it is simply too late for the European micro industry and that companies should be looking to the next generation of computers—particularly at the low end—as the real target.

Bruno Lussato, professor of organization theory and systems at the Paris-based Conservatoire National des Arts et Metiers, is fiercely critical of the European industry's lack of foresight. ''The Europeans did not understand the needs of the market and did not prepare for the advent of microcomputing. The Japanese started in the early '70s and IBM made its major strategy shift in 1978. It is too late for the Europeans now.''

Having lost this round of the fight, the Europeans should look ahead, Lussato believes. ''They must look forward to the consequences of the present move into microcomputing and ask themselves what the Americans and Japanese are preparing that they might miss out on again.''

Also contributing to this article were James Etheridge and Paul Tate.

''. . . It's time for your tranquilizer dart . . .''

CARTOON BY DAVID W. HARBAUGH

Mini sales to systems houses and oems were off in 1982, but total volume soared due to microcomputer demand. The shift may well be permanent.

THE SENTRY SURVEY: YEAR OF THE MICRO

In California, or in a California state of mind, people say that less is more. In systems houses and oems, people say that smaller is bigger, for during 1982, sales of personal computers jumped nearly 70% from the prior year, according to a survey by Sentry Database Publishing, Hudson, Mass. In addition to selling all those micros, the value-added remarketers did a gold-rush business in peripherals and applications programs. At a time when unit sales of minicomputers to these same companies declined slightly, the small systems boom enabled the 2,002 organizations surveyed by Sentry to increase their aggregate revenues to a record $3.7 billion.

The survey for the *Directory of Systems Houses and Computer Oems* included 70% of America's systems houses and oems, representing the market as a whole. The survey respondents sold more than 171,000 computers last year, nearly 122,000 printers, more than 104,000 crts, 83,000 disk drives, and thousands of other products. This mountain of hardware was accompanied by hundreds of thousands of software programs covering every conceivable business use.

Software houses got a noticeably bigger slice of a growing pie during 1982, while the aggregate of dealers, distributors, and commercial oems lost market share even as they achieved larger volume as measured by the number of systems sold. The year saw some big and surprising changes in market penetration by makers of processors and peripherals, many of them owing to superior products and effective distribution.

Not all the survey results are consistent with a single trend, nor should they be. The companies surveyed range from tiny shops with a few employees and sales of less than $50,000 to organizations with more than 1,000 people on the payroll and revenues in excess of $100 million. But there are discernable directions, particularly as feature-packed small machines gain acceptance among the end users served by our survey base.

For one thing, personal computers are not, for many users, simple appliances that can be plugged in and put right to work. To

FIG. 1

PERCENT SHARE OF MINICOMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS

MANUFACTURER	1978	1979	1980	1981	1982
Data General	20.7	20.2	21.6	21.5	11.5
Datapoint	1.4	1.4	2.0	4.2	4.1
Digital Equipment	40.7	46.2	43.5	48.4	42.8
Hewlett-Packard	4.9	3.7	5.2	6.0	7.2
Honeywell	1.4	1.9	1.8	2.5	1.4
IBM	1.3	2.4	5.4	3.2	4.7
Prime	0.7	1.3	1.5	1.5	11.0
Texas Instruments	5.3	2.0	2.1	1.8	5.5
All others	23.6	20.9	16.9	10.9	11.8
Total Sample (units shipped)	**10,546**	**11,089**	**14,066**	**14,463**	**13,440**

FIG. 2

PERCENTAGE OF PERSONAL COMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS

MANUFACTURER	1978	1979	1980	1981	1982
Alpha Micro	—	—	—	1.5	1.0
Altos Computer	—	—	—	—	4.9
Apple	22.4	19.0	48.7	37.9	20.3
Cado	—	—	—	—	1.3
Commodore	0.3	13.0	5.9	6.5	5.4
Cromemco	4.6	4.6	1.7	2.1	2.4
Digital Equipment	—	—	—	—	1.0
IBM	2.3	2.2	1.5	3.7	11.3
Intelligent Systems	—	—	—	—	1.2
Intertec Data	—	—	—	—	2.0
Northstar	9.3	5.0	2.1	4.3	6.1
Osborne	—	—	—	—	1.9
Radio Shack	—	—	—	1.9	1.2
TeleVideo	—	—	—	—	3.5
Texas Instruments	—	—	—	—	3.3
Vector Graphic	1.4	3.7	4.8	1.2	1.6
Wang	14.0	9.6	5.4	4.8	2.5
Xerox	—	—	—	1.2	3.4
All Others	45.7	42.9	29.9	34.9	25.7
Total Sample (units shipped)	**4,639**	**9,344**	**18,188**	**21,750**	**36,792**

Floppies remain the most popular type of disk, but they are not the fastest-growing kind.

take advantage of the available technology, many users must hire systems houses and oems to assemble, configure, and program personal computer systems. The availability of inexpensive computers has opened up new opportunities to value-added remarketers in fields that were not automated in prior years and for smaller companies in business sectors where, until recently, automation has been unaffordable. In particular, more and more software applications are being sold to users in agriculture, food service, finance, publishing, and travel. At the same time, oems and systems houses are witnessing a slump in sales of applications for systems in certain manufacturing-related areas.

The biggest changes in the way systems houses and oems do business seem to be reflected in the 7% decline in minicomputer shipments (by number of machines) from 1981 to 1982. It appears that some of the applications that formerly used minis now run on micros, and this change may help explain the market penetration shift.

FIVE INDUSTRY CLUSTERS

Industry participants were grouped into five clusters. Hardware/product oems sold the most systems, 33% of all those accounted for by our survey. In this scheme, companies in the group design, manufacture, and market standard, off-the-shelf products built around minis or micros. They generally have unique offerings protected by patents or trademarks and usually make their gear on assembly lines. Organizations in this sector grossed 24% of the $3.7 billion in systems sales the survey base logged in 1982. Yet in terms of the number of firms in our survey sample, they make up only 17%. Their share of market, by number of systems, dropped from 1981, but their share of aggregate revenue increased. In short, these companies represent a diminishing share with growing revenues.

The next largest sector of the business, selling 25% of all systems logged, was the category called systems houses and integrators. Companies in this group make customized systems to order. They comprise 42% of the organizations surveyed and take in 40% of the revenue in the business. Compared to 1981, the situation for 1982 for these organizations shows they remain in about the same place relative to other kinds of oems and systems houses.

The next smallest sector includes dealers, distributors, and commercial oems who, all told, sold 23% of the systems reported to us while accounting for 16% of the aggregate revenue. They make up 19% of the firms in our survey base. Their ranks include independent dealers, or distributors that buy whole systems for single vendors. In many cases, they add value by supplying applications software.

Software houses and software oems represent a growing part of the business. These are companies that do not make hardware but do provide software and support to end users. They sold 15% of the systems and generated 17% of the revenue in our survey base. This is an uptake from 1981, when they sold 13% of the systems but generated only 12% of reported revenues. Their population totals 19% of all systems houses/oems.

The last group in the survey is retail stores. They sold 5% of the systems and brought in 3% of the revenue. Only 3% of the companies we polled are in this group, and,

FIG. 3

1982 GAIN IN SYSTEMS SOLD VIA OEMS

Agricultural accounting	+596%
Estate planning, portfolio analysis	+533
Restaurant accounting	+485
Mail list processing	+458
Travel agency accounting	+304

1982 DECLINE IN SYSTEMS SOLD VIA OEMS

Numerical control tape preparation	−84%
Master production scheduling	−69
Bill of material processing	−69
Industrial robot control	−65
Machine tool control	−64

FIG. 4

PERIPHERAL SALES VIA OEMS

	QUANTITY SOLD VIA OEMS				
TYPE OF PERIPHERAL	**1979**	**1980**	**1981**	**1982**	**% CHANGE**
PRINTERS					
Dot matrix	11,149	15,920	51,156	68,994	+ 35%
Letter-quality (daisy-wheel, thimble)*	—	—	—	20,524	N.A.
Line printers (under 300 lpm)	9,869	3,116	8,710	6,494	− 25%
Line printers (300 lpm & up)	1,149	3,266	6,833	6,581	− 4%
Teleprinter terminals (with keyboard)	9,751	5,263	27,633	19,403	− 30%
Group Total	**31,918**	**27,565**	**94,362**	**121,996**	**+ 29%**
DISK DRIVES					
Diskette (floppy) drives	7,072	24,187	41,236	44,553	+ 8%
5¼-inch Winchester drives*	—	—	—	14,250	N.A.
8-inch Winchester drives	134	1,170	4,558	8,423	+ 85%
14-inch Winchester drives*	—	—	—	3,690	N.A.
Fixed disk drives	245	336	682	3,675	+439%
Removable disk drives	4,371	8,376	11,197	8,958	+ 20%
Group Total	**11,822**	**34,069**	**57,673**	**83,549**	**+ 45%**
TAPE DRIVES					
Cassette/cartidge drives	2,208	2,082	4,444	6,708	+ 51%
Reel-to-reel drives	834	3,264	4,323	4,296	− 1%
Group Total	**3,402**	**5,346**	**8,767**	**11,004**	**+ 26%**
CRT TERMINALS/ MONITORS					
Alphanumeric	28,275	37,425	89,008	96,007	+ 8%
Graphic	2,486	1,591	5,578	8,006	+ 44%
Group Total	**30,761**	**39,016**	**94,586**	**104,013**	**+ 10%**
OTHER					
Memory expansion boards	7,183	2,833	13,034	14,643	+ 12%
Digital plotters	748	152	773	1,205	+ 56%
Group Total	**7,931**	**2,985**	**13,807**	**15,848**	**+ 15%**

*New category this year

FIG. 5

DOT MATRIX PRINTER MARKET SHARE

MANUFACTURER	1981 Oem Market Share	1982 Oem Market Share
Anadex	0.3%	2.4%
Centronics	4.3	2.4
Dataproducts	0.9	1.2
Datasouth	0.6	2.4
DEC	10.2	17.5
Epson America	12.1	25.3
Facit	—	1.4
IBM	0.3	1.6
Mannesman Tally	0.5	1.1
NCR	0.1	1.0
Okidata	0.6	9.0
Texas Instruments	22.0	17.6
Wang	1.6	1.2
All others	46.5	15.7
TOTAL UNITS	**51,156**	**68,994**

FIG. 6

LETTER QUALITY PRINTER MARKET SHARE

MANUFACTURER	1981 Oem Market Share	1982 Oem Market Share
C. Itoh		1.2%
Dataproducts		1.1
DEC		2.0
Fortune Computer	New category in this year's directory	1.2
NEC		38.2
Qume		15.3
Wang		1.9
Xerox/Diablo		17.4
All others		21.7
TOTAL UNITS		**20,524**

FIG. 7

FLOPPY DISK DRIVE MARKET

MANUFACTURER	1981 Oem Market Share	1982 Oem Market Share
Apple Computer	3.1%	6.6%
Commodore	1.0	2.4
IBM	0.4	7.2
Mitsubishi	—	1.7
Remex	0.3	1.8
Shugart	45.2	12.6
Tandon Magnetics	1.3	24.3
Wang	1.4	1.3
All others	47.4	42.1
TOTAL UNITS	**41,236**	**44,553**

like systems houses, they hung in there at about the same overall share of market during 1982 as in 1981.

All told, participants in these various aspects of the systems house or oem trade sold 171,236 minis and micros last year. They identified 50,232 of the computers by maker, and of those so identified, 13,440 were minicomputers, while the remaining 36,792 machines were micro based.

Digital Equipment is the leading minicomputer vendor, with a 42.8% share of market. This is a drop from 1981's 48.4%, but clearly the biggest piece of the pie anyway. Data General is number two, just as it was the year before, but the company did suffer a loss of market share from 21.5% in 1981 to 11.5% in 1982. Coming up even faster than Data General is sliding is Prime Computer, number three in '82 with an even 11% of the market, versus 1.5% of the mini market in 1981. Hewlett-Packard is fourth in the mini business among our respondents, with 7.2% of the market, while Texas Instruments runs fifth, with a 5.5% market share.

Among makers of micros, Apple ranks number one in 1982 (as it did in 1981), but a big piece of the company's market share is being lost to IBM. Apple sold to systems houses and oems 20.3% of the microprocessors bought in 1982, compared to 37.9% in 1981. IBM, with 11.3% of the 1982 micro market, rose from a 3.7% share in 1981.

After Apple and IBM in our survey comes North Star, with a 6.1% market share, up from 1981's 4.3%. Commodore got 5.4% of the market in 1982, down from the prior year's 6.5%, while Altos, which didn't show up in the 1981 survey—it was one of the so-called others—sold 4.9% of the micros identified by survey respondents.

DISK DRIVES A HIT

Among the various peripheral devices sold by oems and systems houses in 1982, disk drives were the biggest hits. Some 83,549 were moved during the year, a 45% jump from 1981's 57,673. Floppies remain the most popular type of disk, but they are not the fastest-growing kind. The 44,553 floppy drives sold in 1982 made for only an 8% increase over the prior year's shipments. Systems houses and oems bought 14,250 Winchesters (5¼ inch) in 1982. This type of disk was not in the 1981 survery, but suddenly the mini-Winnie is big business. Larger Winchesters were popular, too, and the 8-inch type hit sales of 8,959, an 85% increase over the prior year's 4,558. In addition, some 3,690 14-inch Winnies were bought by our survey group along with 3,675 units of unclassified fixed disks and 8,958 units of removable-media hard disk.

Tandon is the biggest factor in the floppy disk market, accounting for 24.3% of the purchases by oems and systems houses. A year earlier, Tandon's drives were named by only 1.3% of our survey respondents. Shugart, number one in 1981, is number two in 1982. With 12.6% of the market in the most recent poll, it accounted for 45.2% of the floppy business in 1981.

Tandon is also the winner in the 5¼-inch Winchester market, with a 23.2% share. Right behind Tandon is Caelus Memories, with 21.1% of the market.

Quantum Corp., with a 38.2% share of market, wins 1982's 8-inch Winchester sweepstakes; the company had only a fraction of a percent of the market in 1981. Shugart is number two here, with 16.5% of the market, up from 7.5% a year earlier. In the 14-inch race, Priam comes out on top with a 13.4% market share, while Control Data, with 11.6%, is number two.

Oems and systems houses purchased 121,996 printers in 1982, 25% more than the 94,362 they bought in 1981. The fastest growth was in the dot matrix business, which accounted for 68,994 machines. Survey respondents bought 20,524 letter-quality printers. the second most popular category, followed by telepinter terminals (19,403 units) and, running neck and neck, the two groups of line printers. Systems houses and oems bought 6,494 line printers running at under 300 lines per minute in 1982 and 6,581 printers running at 300 lines per minute or faster.

Epson is the favored vendor of dot matrix printers, with 25.3% of the market, up from its 12.1% share in 1981. Texas Instruments, with a 17.6% market share and DEC, with 17.5%, tie for second place. DEC's 1982 share is an increase from its 10.2% showing in 1981, while TI's share is smaller than the 22% the company racked up a year earlier.

Japanese designs also win in letter-quality printers. NEC sold 38.2% of the machines counted in 1982, followed by Xerox/Diablo, with a 17.4% market share, and Qume, with a 15.3% share. In the low-end line printer group, Digital Equipment, with 19.4% of the market, edged out Dataproducts, with its 18.9% share. DEC had less than 12% of the market in 1981, while Dataproducts had 10.5% Both companies are picking up business at the expense of TI and Centronics, which fared better in 1981. That year, TI grabbed 21.8% of the relevant market, while Centronics had a 10.1% share, which dropped to 3.1% by the time the 1982 survey results came in.

When it comes to faster line printers in the oem marketplace, Dataproducts is the leader, as it was in 1981, but the company's market share, which was 31% in 1981, dropped to 19% in 1982. Number two in

Agricultural applications were up 569% in 1982; estate planning and portfolio analysis applications rose 533%.

1982 is Printronix, with 16.7% of the market, off a bit from its 19.7% share in 1981. DEC is coming up fast here, with 11.6% of the market in 1982 versus only 3.4% in 1981.

Magnetic tape, to systems houses, generally means cassettes and cartridges these days, not reel-to-reel units. Some 6,708 packaged-media units were bought by survey respondents in 1982, a 51% increase over 1981's purchases, while the 4,296 reel-to-reel transports they acquired in 1982 came to pretty much the same number they bought during 1981. All told, the tape market rose 26% to 11,004 units from 1981's 8,767.

Crt terminals are a big business for the survey respondents, but not a business that is growing as fast as some other component areas. The growth from 1981 to 1982 translated into sales of 104,013 units in the latter year, compared to 94,586 in the former. At the same time, graphics display terminals were popping, jumping 44% to 8,006 units in 1982.

DEC CRTS LEAD MARKET

The most popular crt terminals are those made by DEC, which took 16.5% of the market in 1982. Teletype is number two, with a 13% market share. Both vendors picked up relative market penetration from 1981. The company losing the most ground was Lear Siegler, which went from 17.2% of the market down to 1.7%.

Among makers of graphics terminals, Intelligent Systems is the leader with a 13.8% market share, followed closely by Digital Engineering with 12.8% of the market, and DEC with 12.7%.

Digital plotters were up sharply from a small base, accounting for sales to oems and systems houses of 1,205 machines in 1982, a 56% jump from 1981's 773 tally.

Systems sold by the applications they support were also ranked. Because many systems handle several different applications, the totals far exceed the number of actual machines delivered by oems and systems houses. The data reflect areas of growing demand and, unfortunately, areas of diminished importance during 1982. Applications were tallied by number of systems, not by dollar value. The biggest gains were in areas that have been opened up by the availability of low-cost personal computers, while the biggest declines were in mature markets often served by minicomputer systems.

Here are the most dynamic applications areas: agricultural accounting applications were up 569% in 1982 to 14,179 units, proving that computerized farming is the wave of the future. Estate planning and portfolio analysis applications rose 533% during 1982 to 8,791. Restaurant accounting applications jumped 485% to 17,024 systems. Mail-list processing systems deliveries were up 458% to 73,295, and travel agency accounting applications took off by 304%.

On the down side, industrial applications were struck. Numerical control tape preparation systems missed 1981's mark by 84%. Master production scheduling systems lagged by 84%, and bill of material processing applications were down by 69%. Industrial robot control was off 65%. Machine tool control systems programs were ground down by 64%.

The 1983 directory of systems houses is available from Sentry Database Publishing, 5 Kane Industrial Drive, Hudson, MA 01749.

A stroke is not only a caress

Nor is it just a way to swim.

A stroke in the medical sense occurs when an artery or other blood vessel that supplies blood to the brain bursts, or when circulation to a part of the brain is cut off by a clot. This starving the brain of oxygen-rich blood irreversibly damages affected brain cells.

Effects of a stroke may be slight or severe, temporary or permanent. Many stroke victims can resume normal lives after treatment and rehabilitation. Others may survive crippled, or die.

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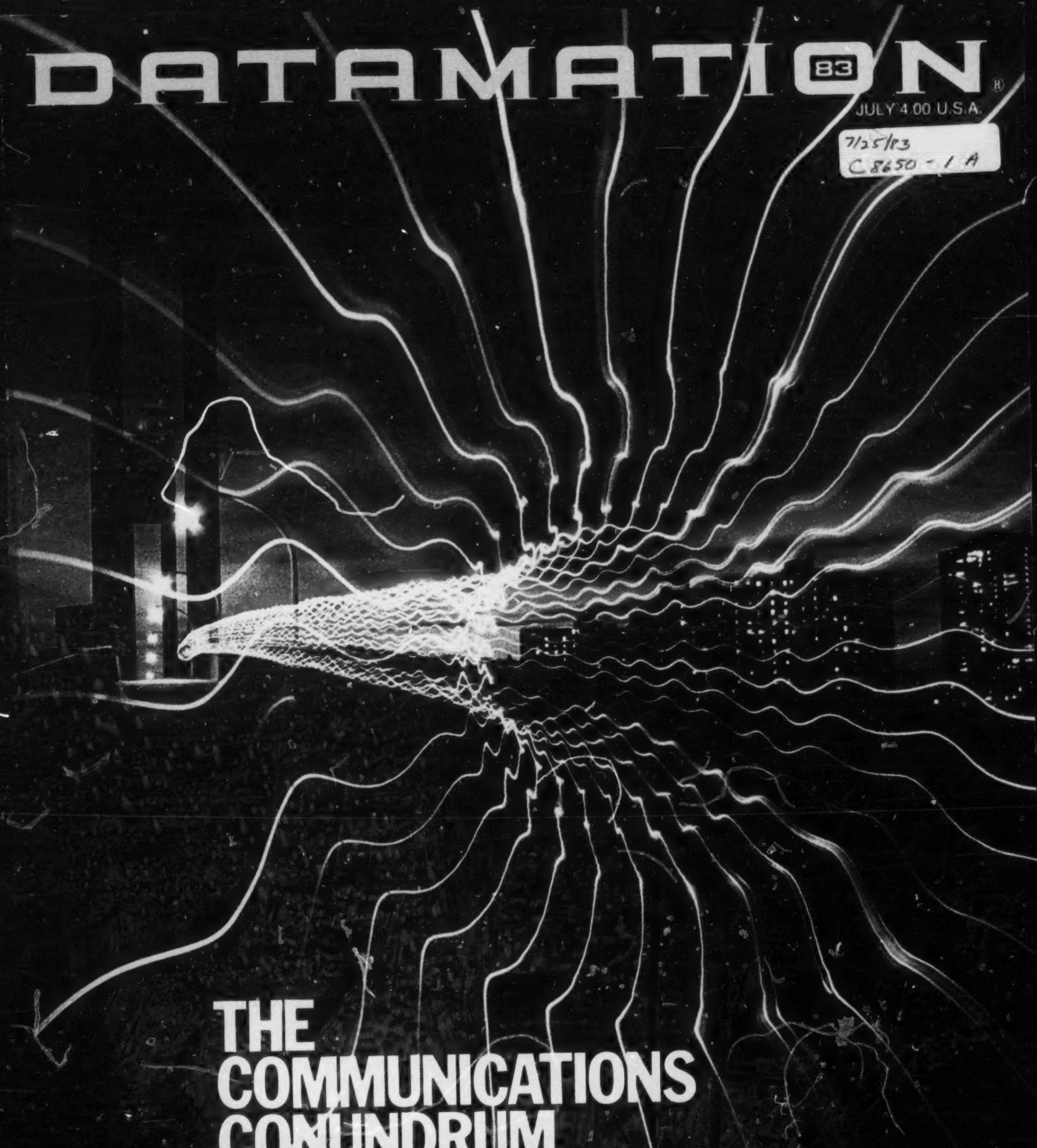

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INSIDE THE FIFTH GENERATION

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COVER PHOTOGRAPH BY ERIC STALLER

Some on-line information services may sell like hotcakes, but others will be about as popular as horseburgers.

IS VIDEOTEXT VENDIBLE?

by Efrem Sigel

Now that videotext ventures like Time's teletext service and Knight-Ridder's Viewtron are moving from labs and research centers into the marketplace, the purveyors of these services must come to grips with the most haunting question of all: how many customers want such pushbutton access to information, and what, if anything, are they willing to pay?

The answers to such questions will not be found in market research surveys or focus groups; ultimately, they will be worked out in the hustle and bustle of the marketplace—and at considerable cost to those who make the wrong bets. Nevertheless, in our fascination with getting the technology to work, one aspect of information retrieval services that has been consistently neglected is this critical one of bringing the price of the service into balance with benefits to the customer on the one hand, and with the cost of providing it on the other. True there has been little actual history of consumer videotext services to date, but there is a wealth of experience with conventional publications, as well as with more specialized on-line services for business and professional customers, from which to learn.

The fact is that if it is to be developed at all, videotext must flourish as an information service, not as a technology. Among the important questions, therefore, for those seeking to introduce videotext services are:

- what is the proper audience for these services;
- what type of information is best suited to electronic dissemination in general and videotext display in particular; and
- whether videotext can be used for transactions like shopping or banking.

The first question to be considered is, what is the most logical audience for these services—business/professional or consumer? The business and professional market consists of companies, professional organizations (law firms, medical partnerships), universities and research centers, and individual practitioners like lawyers, consultants, or accountants. Information services directed to these groups are aimed at providing news of an industry or profession, or improving professional or business skills. The information is either bought directly by the business or by an individual who can deduct it as a business expense.

In contrast, the consumer market consists of individuals who use information at

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Adapted from *The Future of Videotext: Worldwide Prospects for Home/Office Electronic Information Services*. Copyright Knowledge Industry Publications Inc. and Efrem Sigel; published by Knowledge Industry Publications Inc., 1983.

ILLUSTRATION BY ANDREA BARUFFI

Speed and convenience are the obvious reasons that on-line databases have enjoyed such growing acceptance in the business world.

home and pay for it out of their own pockets. Although the information may be related in some way to the person's occupation, he or she is acquiring it out of personal interest or the desire for self-improvement, not to meet a specific business need.

Because a videotext service can be transmitted over telephone lines to a modified tv set, it is often assumed that consumers are the principal users of such services. Phones, however, reach business offices as well as homes, and a computer terminal or other video display terminal will do just as well as a tv set for displaying text. The real determinant of what sort of videotext service makes sense is the information it provides in relation to the needs of the customer.

Business and professional users spend upwards of $9 billion per year for published information and many times that sum for internal information. Internal information for business takes the form of studies and memos; computerized sales and accounting and inventory reports; meetings and presentations. Though the manifestation of this information flow is a blizzard of paper, microfilm, computer tape, and disks, these media account for only a fraction of the true cost of information. The largest expenditures go for the salaries of information workers: managers, secretaries and assistants, researchers, forecasters, accountants, purchasing agents, and dozens of other job categories. The salaries of all white-collar workers in the U.S. total nearly $800 billion annually. In a real sense the product of all these millions of people is information—in the form of numbers, memos, reports, and presentations. That information however, is not the final product of most businesses, but only a necessary ingredient in the production process.

Information *is* the final product of publishers, broadcasters, market research companies, and others who sell to business, and while these total sales are only a fraction of what business spends on information, they still add up to a significant sum. A study of the business information markets estimates that revenues of business information suppliers were $8.9 billion in 1981. The study depicts the principal segments of that total as shown in Fig. 1.

FIG. 1

BUSINESS INFORMATION REVENUES BY SEGMENT, 1981

SEGMENT	REVENUES (IN MILLIONS)
Trade magazines	2,156
Databases	2,610
Newsletters and loose-leaf services	1,018
Research services	520
General business periodicals and services	800
Trade shows and seminars	1,660
Books	155
TOTAL	**8,919**

Source *The Business Information Markets 1982-87* (White Plains, NY Knowledge Industry Publications Inc., 1982.)

DATABASES GENERATE $ BILLIONS

One of the best indicators of the potential for videotext in the business and professional market is the amount being spent to acquire information in computerized form. According to the figures in Fig. 1, all databases, both in printed and electronic formats, generate $2.6 billion in revenue. The portion that is distributed online, however, is only a fraction of this total—estimated at $680 million in 1981.

FIG. 2

GROWTH IN ON-LINE SERVICES

	1975	1977	1979	1981
Number of on-line databases	301	362	528	1,028
Number of records[1]	33,000,000	50,000,000	116,000,000	200,000,000
Number of customers	under 5,000	17,000[2]	57,500[2]	199,145

[1] Bibliographic data bases only

[2] 1977 and 1979 figures interpolated on basis of 94% annual growth rate

Source *The Business Information Markets 1982-87* (White Plains, NY Knowledge Industry Publications Inc., 1982.)

A tabulation done by *IDP Report* newsletter shows that the market for on-line databases has been growing by more than 80% per year for the last five years, although the rate of growth has slowed, since 1980, to perhaps 40% a year. Fig. 2 shows some of the principal indicators.

Speed and convenience are the obvious reasons that on-line databases have enjoyed such growing acceptance in the business world. Certainly these databases are not cheap to use. Hourly rates for services offered by Lockheed's Dialog, Dow Jones, and Mead Data Central range as high as $125 or $150 per hour; even inexpensive databases can cost from $35 to $75 per hour. Since many database customers spend several hundred dollars a month to use these services, they must feel that the expenditure is worth it.

Though we are accustomed to classifying information products by form or medium (magazine, book, newsletter, tv program), it may be more helpful to examine information in terms of its role in the decision-making proccess and other professional activities. Such a classification will also point up the suitability of different types of information for electronic dissemination.

Analyses done by the editors at Knowledge Industry Publications Inc., suggest five categories of business and professional information:

1. *Transaction-oriented information*—names and addresses, prices, stock quotes, items for sale. Availability of this information leads directly to a transaction, such as a phone call, letter, or purchase.

2. *Decision-oriented information*—facts, numbers, opinions, impressions—used directly to make a decision. Numbers gathered by independent research services, like the Nielsen television ratings, are an example of information that leads directly to a decision, e.g., take a show off the air.

3. *Background decision information*—consisting of the same sources as in (2), but not used the same way: the reader assimilates the information for use in the future, rather than immediately.

4. *General interest information*—from newspapers, trade magazines, radio, tv, conferences, personal conversations. This type of information is much more diffuse and random than in categories 1, 2, and 3, and

FIG. 3

TYPES OF BUSINESS/PROFESSIONAL INFORMATION AND SUITABILITY FOR ELECTRONIC DISSEMINATION

CATEGORY OF INFORMATION	EXAMPLE	SUITABILITY FOR ELECTRONIC DISSEMINATION
1. Transaction-oriented	Names, addresses, stock quotes, classified ads	Good to excellent
2. Decision-oriented	Facts, numbers, survey information, financial information	Good
3. Background decision	Same as above	Good
4. General interest	Newspaper articles, sales reports, information for meetings and seminars	Poor to fair
5. Skills-oriented	How-to techniques of management, sales, accounting	Poor

FIG. 4

CONSUMER INFORMATION AND ENTERTAINMENT SERVICES

(in $ millions)

CATEGORY	CONSUMER OUTLAYS	SUPPLIER RECEIPTS
Newspaper circulation	$6,750	$4,350
Book purchases	6,030	4,330
Motion picture admissions	3,450	1,500
Magazine circulation	4,570	3,385
Cable and pay tv subscriptions	4,200	4,200

Source: Knowledge Industry Publications Inc.

contributes to a manager or professional's general awareness, rather than to specific decisions he must make.

5. *Skills-oriented information*—techniques of management, sales, accounting, etc. Such information usually comes from a combination of face-to-face, printed, and audiovisual sources.

In general, the more information is used for a transaction or a decision, the higher the price it commands—and the more the recipient is willing to pay for the speed and convenience of electronic delivery. In addition, because information in these two categories often consists of specific facts, numbers, names, addresses, etc., it is particularly suited to display on a screen. Electronic information services are best when the user needs to retrieve specific facts, and worst when the user needs to read an entire document or browse through a mass of material. Fig. 3 shows the different types of information and their suitability for electronic dissemination.

CONSUMER INFO MARKET

Although supplying information to consumers is a multibillion dollar business for the world's broadcasters and newspaper, magazine, and book publishers, no one can say for certain exactly what influences consumers to choose one medium over another, or any medium at all, to acquire information. Education, social class, occupation, and personal preference all play a role; it is obvious that the people who watch a televised opera from New York City's Lincoln Center have different tastes than those who, at the same hour, choose to view *Laverne and Shirley*. The person who subscribes to *Scientific American* displays distinct differences from one who picks up the *National Enquirer*. Some broad generalizations are available to distinguish heavy tv watchers from devoted magazine readers; for example, the former are depicted by researchers as less well educated and more passive, the latter as better educated and more active. But these broad statements may tell less than they seem to. Tv watching, after all, is well established in every age group, social and educational class, and most adults read some publication, whether it is the daily newspaper, a favorite magazine, or a best-selling book.

One helpful guide to media behavior is the attempt to understand the different functions that media perform for individuals. In a paper published by the Harvard Program on Information Resources Policy, Christine Urban identifies three such functions: 1) information acquisition, or "surveillance"—people use the media to locate specific facts, from train schedules to box scores to what the prime minister of Great Britain said yesterday; 2) social connection—broad information of use in social situations; and 3) escape—diversions from day to day cares through fiction, movies, tv entertainment.

Although these categories are different from those shown in Fig. 3 for business and professional information, they too can be ranked according to their suitability for electronic dissemination. Only the information in the first category is well suited to electronic display; once again the determining characteristic is the search for specific facts that can be viewed on a screen.

Consumers' need to acquire specific facts, however, it not by itself enough to support a computer-based videotext service. The consumer market for information services has marked differences from the business and professional market, principally with regard to how information is paid for. Newspapers and magazines are the largest segment of the consumer market and these publications derive most of their revenues from advertising, rather than from reader outlays. Books are the next largest segment; when measured in terms of customer outlays rather than publishers' receipts, books significantly outrank magazines. A striking characteristic of the three major printed consumer information media—newspapers, magazines, and books—is their very low cost per unit of information, per page or per word. In part this reflects advertiser support of a large part of the cost of publication; in part the fact that purchase of a magazine or book is highly discretionary.

Whereas the lawyer has no choice but to subscribe to a looseleaf service in his area of specialty, the consumer need not buy any book for recreational reading. He can go fishing, watch tv, or garden in his leisure time; if

The more information is used for a transaction or decision, the higher the price is commands.

he does read, he can choose from over 400,000 books in print at any one time. This choice acts to keep the price of publication down, and to force publishers to seek the widest market for any title. There are some fields of consumer information in which publishers consciously seek to produce higher priced books or magazines for a narrow audience—expensive art books, sometimes in limited editions, or encyclopedia sets—but these are the exception.

Also, when it comes to consumer information services, audiovisual formats—notably radio and television—help to dampen the price that can be charged for printed publications. Services supported entirely by advertising, tv, and radio, appear "free" to the consumer, once he has bought the receiver. Only since the mid-1970s have consumers begun to spend large sums out of their own pockets to receive tv programs via cable television, or to buy prerecorded programs on video cassette or disk.

Fig. 4 shows the outlays by consumers for entertainment and information services. To illustrate the difference between publisher or supplier receipts and consumer expenditures, both sets of figures are given.

MODEST LEVEL OF OUTLAYS

Several conclusions stand out after examining this pattern of consumer spending for information services. One is the extremely modest level of outlays per household for even the largest categories of information. Consumer purchases of $6.8 billion annually on newspapers are significant, but measured against 83 million households, that sum works out to only $81 per year. And the newspaper is the only one of the printed consumer services that is nearly universal in its reach. Whereas 75% of all households buy a newspaper every day, the proportion that subscribe to magazines or buy books is far smaller. Surveys show that about 60% of all households subscribe to one or more magazines. The circulation of all general consumer magazines totals 298.7 million. This works out to about 3.6 magazines per household. At a typical subscription price of $16 per year consumer outlays for magazines are approximately $4.6 billion annually.

As for book purchases, a smaller proportion of consumers buy books than subscribe to newspapers or magazines. Whereas 75% of all households take a daily paper, and whereas magazine circulation averages three per home, surveys show that less than half the adults in the U.S. have read a book in the past six months. The only truly large volume books in the U.S. are mass market paperbacks; about 550 million of these are sold annually. If we assume, arbitrarily, that 25% of these copies go to schools, libraries, and individual students, that leaves consumer sales of 413 million, or an average of five per household. Studies have consistently found that a large share of paperback sales are made to a small minority of purchasers, some of whom buy or read a book per month.

FIG. 5

UNIT COST OF INFORMATION IN NEWSPAPERS, MAGAZINES, AND BOOKS

	PRICE	NUMBER OF PAGES	NUMBER OF WORDS	COST PER PAGE	COST PER 1,000 WORDS
The New York Times	$ .30	40	120,000	$.0075	$.0025
Reader's Digest	1.29	110	40,000	.0100	.0300
The Covenant	4.75	800	400,000	.0060	.0100
Webster's New Collegiate Dictionary	21.95	1,532	8,000,000	.0140	.0030
Average Cost				.0090	.0100

Source: Knowledge Industry Publications Inc

Since books, with rare exceptions, carry no advertising, consumers pay the entire cost of information. This explains why even paperbacks have much stiffer cover prices than do newspapers or magazines. A revealing way of analyzing what consumers pay for printed information services, and one that is useful in comparing print and electronic delivery, is to measure that cost per page and cost per word. Fig. 5 does this for four examples of printed consumer publications: *The New York Times* (daily), *Reader's Digest* (monthly), a bestselling paperback, *The Covenant*, by James Michener, published by Fawcett Books, and *Webster's New Collegiate Dictionary*, published by the G. & C. Merriam Co.

Fig. 6 gives a similar analysis for business information publications including *Business Week* magazine, the *Encyclopedia of Associations* published by Gale Research Co., the *Daily Report for Executives*, a newsletter from the Bureau of National Affairs, and the *Federal Tax Reporter* from Commerce Clearing House. While it is misleading to compare information services purely on such a quantitative criterion as cost per physical unit of information, the magnitude of such cost does give a useful guide for understanding how consumer and business information services differ. Thus, the significance of Figs. 5 and 6 can be summarized in a single, stark comparison: the business services cost 18 times more per page and 31 times more per thousand words than the consumer services (see Fig. 7).

Striking as this difference is, it is actually understated as a result of including *Business Week* in the business information services tabulation. *Business Week* is usually classified as a consumer magazine because of the breadth of its readership; certainly it resembles consumer magazines in its economic underpinning which relies on advertising for more than three quarters of its revenue. Without *Business Week*, the business service turns out to cost 23 times more per page and 40 times more per thousand words than the consumer publication. Although the role of advertising in certain publications is a central one, this enormous disparity in cost cannot be explained solely by the absence of advertising in many business services. Note that the paperback listed in Fig. 5, *The Covenant*, has the lowest cost per page, and the second lowest cost per word, of the three publications analyzed.

Though we haven't included audiovisual services in this analysis, it would be perfectly feasible to do so. One result would be that tv and radio are incredibly cheap to the consumer when measured on a cost per word basis.

Even where consumers pay for video information, as in monthly cable tv subscription fees, the cost turns out to be infinitesimally small. A cable system with 30 channels, averaging 15 hours per channel per day, will give the consumer access to 13,500 hours of programming per month at an average cost of $9. Each hour probably contains at least 9,000 words of spoken information (there's no ready way to count visual images) and the number of words transmitted comes to a staggering total of 121.5 million words a month for a cost per thousand words of $.00007. Even if we divide this by 30, in recognition that an individual can watch only one channel at a time regardless of how many choices he has, the total words transmitted is still 40 million for a cost per thousand words of $.0002.

Consumers' need to acquire specific facts is not by itself enough to support a computer-based videotext service.

FIG. 6

UNIT COST OF INFORMATION IN BUSINESS MAGAZINE, DIRECTORY, NEWSLETTER, AND LOOSE-LEAF SERVICE, 1981

	PRICE	NUMBER OF PAGES	NUMBER OF WORDS	COST PER PAGE	COST PER 1,000 WORDS
Business Week					
single issues	$ 2.00	160	50,000	$.033	$.04
one-year sub.	34.95				
Encyclopedia of Associations (annual)	140.00	1,600	1,100,000	.087	.127
Daily Report for Executives one-year sub.	3,175.00	7,500	13,750,000	.42	.85
Federal Tax Guide Reports one-year sub.	230.00	1,950	1,053,000	.12	.22
Average of 4 publications				.165	.31
Average of 3 publications (excluding *Business Week*)				.209	.40

Source: Knowledge Industry Publications Inc

PRESENT BEHAVIOR A GUIDE

The point of all this discussion about the cost of existing information services is to see what we can learn about videotext. The world of existing information services is complex, sometimes confusing, often untidy. But it is a world in which customers daily hand over hundreds of millions of dollars and receive information in return. If we want to know what kind of information people want, the form in which they want it and the value they set on it, we have no better guide than their present behavior.

It must be said that there is a tremendous air of unreality about many discussions of videotext because they are not grounded in economic experience. Few such services around the world are receiving any money from customers. The largest commercial service, British Telecom's Prestel in England, is receiving money, but estimates are that Prestel is spending up to several times as much as it is receiving. Even if this ratio were to be reduced somewhat, it's not a state of affairs that can go on very long. The cuts in staff and computer centers announced by Prestel in late 1981 reflect this fact, as does the organization's increasing concentration on commercial customers.

Looking at the cost of information in conventional printed services gives us some groundwork for examining the costs of electronic services, whether in an on-line computer database or in videotext form. The main problem in making the comparison is that printed services are sold outright; cost remains the same whether the customer reads all of a publication or only a fraction; whether he glances at it briefly and throws it away—as in the case with many daily newspaper readers—or whether he keeps it on the desk or by the bedside to refer to repeatedly—as might be done with any number of publications from an industry directory, to the *Guiness Book of World Records* or the Bible.

Most electronic information services today charge predominantly by time—the minutes or hours that a customer is connected to the computer. Some also charge per unit of information retrieved, e.g., about 15 cents per *Chemical Abstracts* citation displayed on a vdt or printed out, or 5 cents for a listing of London restaurants on Prestel, courtesy of the Consumers Association. And a few have an annual subscription fee, or requirement that the customer receive a printed publication in order to use the on-line service.

Charging by the clock favors the on-line customer who knows exactly what he wants, uses the computer to get it with a minimum of wasted time, then moves on to something else. A journal citation from Engineering Index, a summary from the New York Times Information Bank, the latest gold bullion prices on Prestel, may cost him $2 or $5 or 50 cents, but that is the total expenditure. There is no hunt for the information in a book, no time-consuming trip to the library. Paying by the clock can be far more expensive than using a print publication, however, if the same publication is consulted repeatedly over time.

To compare the cost of print publications that carry a one-time price with electronic services charging by the clock, is not a straightforward exercise. It can be done, however, with the aid of a few assumptions. Let's take two examples: a printed newspaper compared to its electronic alternative, and a business directory.

A printed newspaper like *The New York Times*, as noted in Fig. 5, contains 40 full-sized pages of editorial information, with approximately 120,000 words of text. It costs the consumer 30 cents on the newsstand, perhaps 50 cents delivered at home. The cost per 1,000 words is $.0025 (less than three tenths of a cent), or $.0041 delivered at home.

An alternative to buying the *Times* is to subscribe to The Source, one of two leading information services available on-line. The Source charges customers $5.75 per hour in evening hours and delivers information to a vdt or home computer attached to a tv set, at a rate of 300 characters per second. The Source is capable of displaying 25 lines of 80 characters each, or 2,000 characters, although many displays contain fewer characters. Assume that a Source subscriber uses the service for 12 minutes a night to scan the day's headlines and news stories from United Press International, to see sports results, to look at stock market highlights, including closing prices of selected companies. In 12 minutes the customer might look at 20 complete screens of information, containing 225 words each, or a total of 4,500 words. The cost on his Source bill will be $1.15 in computer time. The cost of the telephone time, making a local call during evening hours, will be roughly 12 cents, for a total of $1.27. The comparison between the printed and electronic newspaper then looks as follows:

	The New York Times	The Source	Ratio
Total cost	$.30	$1.27	1:4.20
Cost per 1,000 words	$.00025	$.282	1:110

In other words, The Source is four and a third times more expensive than the *Times* on an absolute cost basis; it is 110 times more expensive on a cost-per-thousand-word basis.

The world of existing information services is complex, sometimes confusing, often untidy.

BUSINESS DIRECTORY DIFFERENT The comparison between print and on-line versions of a business directory presents a slightly different picture. As noted in Fig. 6, the print version of the *Encyclopedia of Associations* costs $140, and has 1,600 pages of information with approximately 1.1 million words of text. The cost per thousand words is $.127, or about 13 cents.

The on-line version of the *Encyclopedia of Associations* is available from Dialog (a major information retrieval service). Dialog charges $55 per connect hour (not including telecommunications charges) to access the *Encyclopedia of Associations* database, and can deliver information to customers with Dialog-compatible terminals at a rate of 120 characters per second.

For an on-line user, the cost for 10, 30, and 50 lookups per year (assuming each lookup takes three minutes) would be as follows (not including telecommunications charges of from $5 to $8 per hour):

10 lookups = $ 27.60
30 lookups = $ 82.80
50 lookups = $138.00

The cost comparison between owning the printed directory and subscribing to the on-line version looks as follows:

	Print directory	Dialog	Ratio
10 lookups	$140	$ 27.60	5.:1
30 lookups	$140	$ 82.80	1.7:1
50 lookups	$140	$138.00	1.01:1

For the occasional user (10 lookups per year), the cost of owning the print directory is about five times as expensive as subscribing to the on-line version; for the moderate use (30 lookups per year), it's about one and half times more expensive; and for the frequent user (50 lookups per year), the cost is about equal.

The implications of the preceding discussion can be summarized succinctly. Whereas business and professional customers are used to paying large amounts for printed information, and are increasingly ready to pay even more for the convenience of on-line access, residential consumers have no such disposition. Consumers pay only modest sums out of their own pockets for newspapers, magazines, and books. Much of the cost of newspapers and magazines is subsidized by advertising. The fact that most such consumer purchases are discretionary causes intense competition on the part of publishers, thus keeping prices low. When measured by the quantity of information transmitted, even supposedly low-priced on-line services like The Source actually cost 100 times as much as the printed newspaper.

If consumers won't pay for videotext services out of their own pockets, then the consumer market is just not a good bet for videotext. However, there are several ways in which consumers might not have to pay directly for such a service.

FIG. 7

RATIO OF UNIT COSTS OF BUSINESS TO CONSUMER INFORMATION SERVICES

	PER PAGE	PER 1,000 WORDS
Average cost per page, 4 consumer publications	$.009	$.01
Average cost, 4 business publications	.165	.31
Average cost, 3 business publications (excluding *Business Week*)	.209	.40
Ratio, business to consumer (with *Business Week*)	18:1	31:1
Ratio, business to consumer (without *Business Week*)	23:1	40:1

Source: Knowledge Industry Publications Inc.

The most obvious is broadcast teletext. In this case information will be provided free of charge by a broadcaster; in the U.K. the cost is borne by tv license fees; in the U.S. it would probably be borne by advertising. Since costs of storage and transmission are low, and since much of the information is gathered anyway by existing news staffs, there is little economic obstacle to introduction of teletext. It need not be a service with mass appeal, but ought to have a market.

Beyond the market for teletext, however, there are interesting possibilities for advertiser-supported information in computer-based videotext systems. There are also prospects for transaction services in which computer processing actually saves the customer money. The following section will discuss several possibilities.

TRANSACTION SERVICES Although consumers shell out $25 billion a year for information, this is not a large sum when held up against the total of consumer spending, or even the amount of purely recreational spending. People in the U.S. pay $6.8 billion for newspapers, but $34.2 billion for beer, wine, and liquor. And the $6 billion for books shrivels in comparison with what is spent annually on cosmetics, $30.7 billion.

Because the retail distribution system involves such heavy costs in moving goods from one place to another, and because customers must devote so much time to finding the things they need to buy, one obvious use of electronic communication systems like videotext is simply marketing for marketers and shopping for shoppers.

In concept the idea is wonderfully appealing. The computer stores many thousands of items for sale, with descriptions, prices, and names of suppliers. Information might come from a variety of sources. A huge retailer like Sears Roebuck could give customers electronic access to its catalog—thousands of individual products from a single source. Diagrams or even color photographs of certain products could be stored and transmitted at the touch of a button. After the user has looked at the description of an item, he could then decide to order it. Touching a few more keys would send his credit card or account number to the central computer, which would check his credit and flash an acknowledgement of the order. The supplier, in this case Sears, could use the computer record to produce an invoice, a confirmation or packing slip, and any other paper work to finish the transaction.

Developing such a shopping service involves many problems. But awakening a consumer desire to shop at home is not one of these. Shopping from catalogs or by mail order is already an enormous business in the U.S. One estimate places it at more than $100 billion annually. It has been growing by 11% a year, compared to the 10% rate for retail sales in general. The business is smaller overseas, but still important. In Britain mail order sales are more than $4 billion, in Germany more than $8 billion, according to the Direct Mail Marketing Association.

In all these cases the sums are much larger than the outlays for printed publications. If a videotext system can really operate in the manner sketched above, as a giant catalog shopping service, it has the potential of many billions of dollars annually in transactions.

Such a service has another aspect that should be of special interest to newspaper and periodical publishers—or broadcasters—who derive most or all of their revenues from

Nothing prevents the videotext systems organizer from having an economic stake in transactions resulting from using the service.

advertising. Advertising today is sold by space or time; the publisher or broadcaster gets paid regardless of how successful the ad is, but if the ad is very successful the publisher gets not a penny more than if it is modestly worthwhile. In a videotext service organized by, say a daily newspaper, this relationship between publisher and advertiser could change significantly. Nothing prevents the videotext system organizer from having an economic stake in the transactions resulting from use of the service. The stake could be a handling charge per order, or a percentage of the value of the order. In either case, the system owner stands the chance of much greater profit than in simply selling advertising space, because he performs the role of active middleman, something that is not the case with conventional one-way printed services.

USES IN BANKING INDUSTRY

If the potential in marketing is great, so are the opportunities in financial services. The number of checks processed annually in the U.S. is beginning to approach the number of grains of sand on the beach. In 1980 the figure was 39 billion, according to the American Bankers Association. At a cost per check estimated at 40 cents, the banking industry spends $15.6 billion just for the physical handling of this paper avalanche. According to several banking organizations, many thousands of people in the banking industry work on check clearing, many of them on night shifts, so that the banks can open their doors to the public every morning showing accurate balances in their accounts.

Electronic funds transfer is not a new subject in banking; it has been the subject of exhaustive study for at least a decade. But the problem of getting citizens to accept and use complex computer terminals to do their banking is a formidable obstacle. Videotext offers a way out of this dilemma. Videotext services use equipment designed to be low cost, and computer protocols that are easy to learn. They offer access to a variety of information and entertainment services. If videotext can be a way of introducing computer equipment into the home, speedy and convenient financial services could be a way of getting people to use the equipment. This is the rationale behind such well-known bank-at-home experiments as Bank One's effort in Columbus, Ohio, and United American Service Corp.'s undertaking in Knoxville, Tenn.

Transactions like shopping and banking are candidates for videotext for another reason besides their sheer size in economic terms. That reason is that in one form or another these activities are obligatory. We can do without a subscription to *Time* magazine, but none of us can go without purchasing the dozens of goods and services—from food to property insurance—that are essential to daily living. In the same vein, a person need not read the paper every day, let alone subscribe to its videotext equivalent, but he can hardly dispense with writing checks or otherwise paying for what he buys. Since shopping and paying for purchases must take place anyway, if electronics makes it possible to do them more cheaply or easily, there is every incentive to adopt these new systems.

Companies engaged in banking, financial services, direct marketing, or other transaction services are among the most sophisticated users of computerized information services in a modern society. American Express, for example, maintains computerized records on 13.3 million cardholders. Visa and MasterCard holders are believed to number more than 158 million. An estimated 39 billion checks are processed annually—which works out to about 2.7 million checks per bank. The worldwide banking industry has developed special computer and telecommunications networks like SWIFT (Society for Worldwide Interbank Financial Transfers) to speed the settlement of transactions among members around the globe.

In fall 1981, U.S. banks began a system whereby credits or debits with European banks were handled the same day, instead of overnight, as previously had been the case. Electronic communication has become the cornerstone of international financial and commodity markets that never shut down—when the London Stock Exchange is finished for the day, New York is still going; when New York closes, the Pacific Exchange is still open, and so on around the globe. A telephone or telex machine and a terminal that can be plugged into any computer around the world are all that a trader needs to be in business, whatever time it is according to the office clock on the wall.

LARGE FIRMS USE RESOURCES

Although not as dependent on instantaneous information, large companies engaged in direct marketing are just as sophisticated in using computerized information resources. The R.H. Donnelley division of Dun & Bradstreet and R.L. Polk Co. maintain computerized files of upwards of 100 million names and addresses for U.S. residents. These files are the basis for a vast mailing list business, as well as for other marketing services involving economic projections, location of new stores or plants, etc. Individual marketers like Sears Roebuck or Montgomery Ward have lists of catalog customers that run into the millions as well.

For certain industries, like airline travel, the existence of a computerized information system is more essential than the existence of the industry's production facilities. An airline can keep functioning if one or two of its planes are grounded for repairs, but it can operate with only the greatest difficulty if its computerized reservation system grinds to a halt. Backup for the computer system is more important than backup for any single plane.

The information stored in these proprietary computer systems is of varying usefulness. Some of it, like a list of yesterday's airline passengers, may be virtually worthless. Other information, like the names and addresses of American Express members who spend $1,000 a month with their cards, can be of enormous commercial value. Videotext technology raises the possibility that this information can be exploited: a marketer can use a videotext system as a means of addressing messages to its best customers. A bank can use terminals installed on customers' premises to deliver other information besides the day's balance. Once a customer is linked to an information provider's terminal, for whatever purpose, the link is a highway along which other information may travel.

It is this fact of modern computer technology that threatens to change the way information is bought and sold in modern societies. If a publisher is someone who has information, an audience, and a way of getting the information to the audience, then Sears Roebuck in Chicago, Barclays Bank in London, and Nomura Securities in Tokyo fit the definition of publisher as well as *The New York Times*, the firm of William Collins & Sons, or the Japanese newspaper publisher, Nihon Keizai Shimbun.

Understanding the role of videotext services requires an understanding of how customers acquire information for business or personal use. Because this process is so complex, there can be no straightforward answers concerning the market for videotext. Nevertheless, the following general conclusions can be offered:

1. the business/professional market is far more promising in the near term than is the consumer market;
2. whether the market is business or consumer, the retrieval of specific facts is the most logical videotext application; and
3. videotext services may first appear in homes as a way for users to conduct shopping or banking; the purchase of information for its own sake should be a more limited activity. ◆

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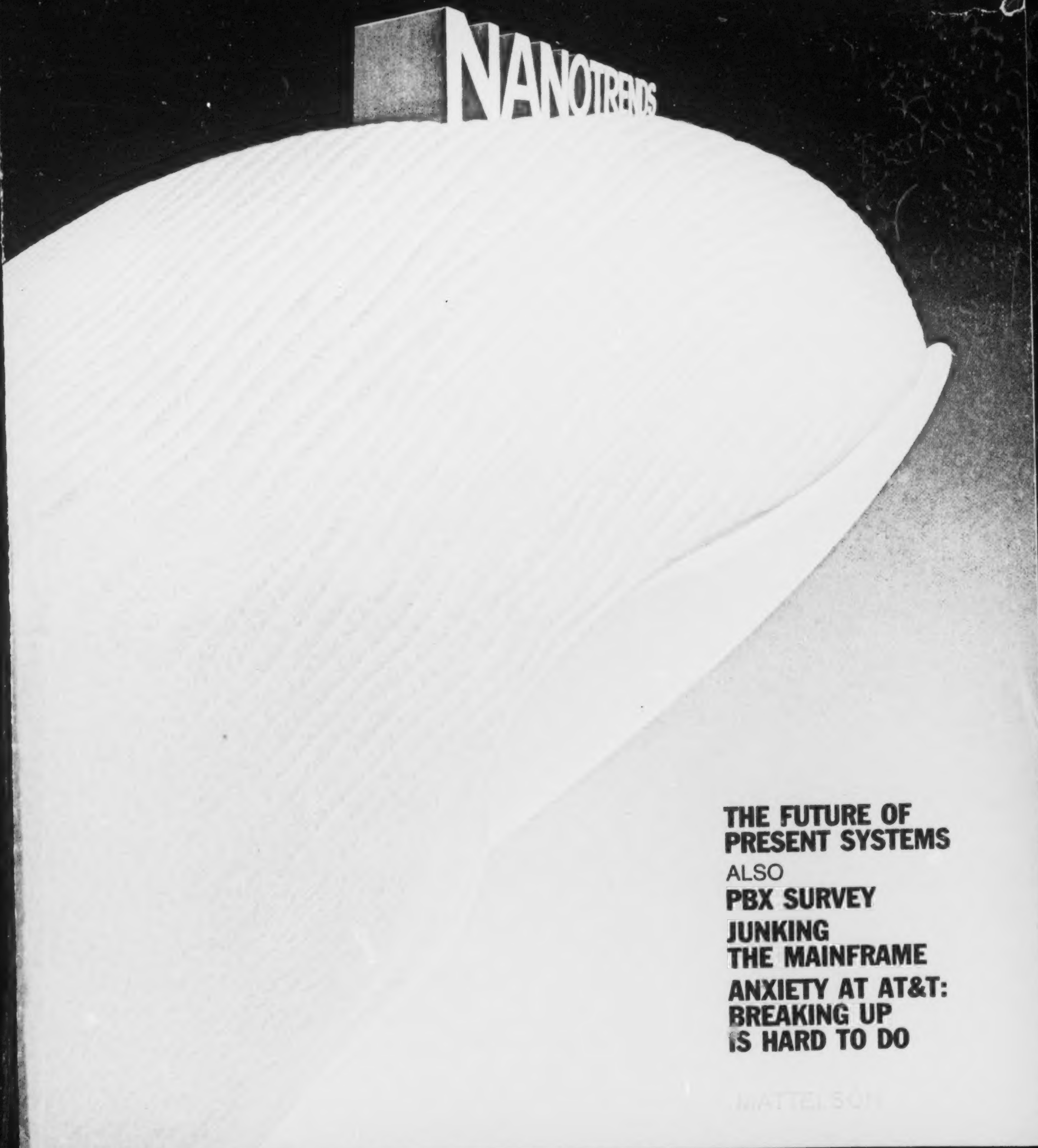

NANOTRENDS
MATTELSON

THE FUTURE OF PRESENT SYSTEMS

ALSO

PBX SURVEY

JUNKING THE MAINFRAME

ANXIETY AT AT&T: BREAKING UP IS HARD TO DO

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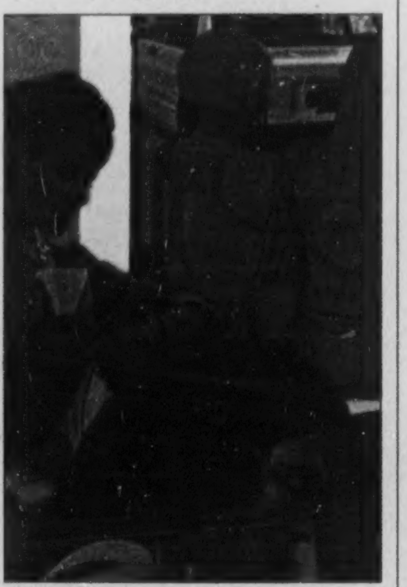

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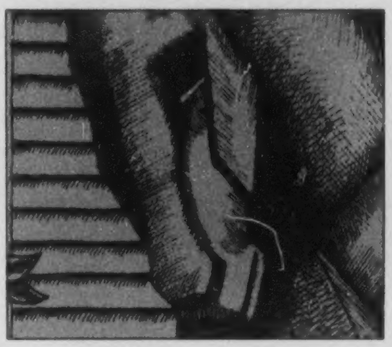

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COVER BY MARVIN MATTELSON

DATAMATION tracks the top European dp companies.

EUROPE'S LEADING LIGHTS

The leading lights in the European data processing industry began to shine again in 1982, albeit dimly. The Top 25 companies saw total revenues rise 6% over 1981, and early forecasts for this year are optimistic.

There is still room for improvement, however. Much of the growth came from acquisitions, rather than from any identifiable surge in business. The Top 25 companies suffered from static markets for traditional data processing products. The large companies on both sides of the Atlantic also missed out on much of the microcomputer boom in Europe that last year benefited small and middle-size suppliers.

The recession continues to take its toll and there was only scant evidence that Europe's long-awaited economic recovery had arrived. Financial indicators did twitch upwards, but this was erratic and overall performance remained generally flat.

European governments still blamed U.S. monetary policies for retarding the rebound. Economists, meanwhile, switched their obsessions from inflation and high interest rates, which were down to 9% across the ECC, to unemployment and the fall of European currencies against the dollar.

The Swedish and French currencies were hit the hardest during 1982, registering drops of 34% and 24%, respectively, against the dollar. Italy (20%) and the U.K. (17%) were less badly affected, while intervention by the Federal Bank in West Germany managed to hold the decline of the deutschemark to only 12%.

U.S. firms were also damaged by the exchange rates, but one American giant, IBM, still managed to pull in sizable profits. And needless to say, IBM's position as the number one data processing company in Europe is as rock solid as ever.

Six companies improved their rankings in the 1982 DATAMATION Top 25. The largest leap was made by office automation vendor Wang, up five places. Olivetti turned in impressive results during 1982, vaulting four rungs up the ladder into second place behind IBM. The Italian company can now call itself Europe's leading dp company, having pushed CII-Honeywell Bull, Siemens, and ICL firmly out of the way last year. The merger of Datasaab and LM Ericsson also moved the Swedish company up four notches.

Burroughs and Nixdorf have both jumped three places but for rather different reasons. Burroughs's acquisition of Memorex was responsible for its advancement, whereas Nixdorf earned its number nine position entirely under its own steam. Two other German companies also turned in good performances during 1982—Kienzle and Triumph Adler. Kienzle inched up one place to the 19th slot, while Triumph Adler, strong in office equipment, made its debut in the Top 25, showing up in position 22.

Twelve companies lost ground in the Top 25 table. Ferranti and ITT slipped five and three places, respectively, and a lackluster year for Rank Xerox in Europe meant that it was overtaken by Ericsson, Wang, and Kienzle. The eclipse of CII-Honeywell Bull, Siemens, Digital, and ICL was mostly attributable to Olivetti's rising star. Sperry, Control Data, NCR, and Data General all seem to have suffered from the malaise affecting most U.S. companies that have not adjusted fast enough to changing market conditions, especially in the field of microcomputers and office automation.

Figs. 1 and 2 show the top revenue earners. As was true last year, the fluctuating exchange rates make it appropriate to indicate growth rates in both U.S. dollars and accounting currencies. Ericsson, Burroughs, and Olivetti all achieved very impressive growth rates in both currency calculations (Burroughs's figures include African revenues).

For the first time DATAMATION has also produced a ranking of the top European-owned companies. Fig. 3 shows European revenues measured in U.S. dollars. Ranking at the bottom of the Top 15 table are two major French computer services companies—CISI and Cap Gemini Sogetti. Set up by the French government in 1972, CISI, an offshoot of the French Atomic Energy Agency, took in revenues of $143 million last year. Meanwhile, Cap Gemini Sogetti, which bought a 35% stake in the software services firm Société d'Etudes des Systemes d'Automation (SESA), reported 1982 dp revenues of $125 million.

In the main table there is one more European company (13 as opposed to 12) than in last year's table. The proportion of the total revenue attributable to European-owned companies, however, is almost unchanged from 1981. Of the 13 European-owned companies, four are German, three each are from the U.K. and France, with one each from Italy, Sweden, and the Netherlands. This breakdown reflects the relative size of the major European markets in the dp industry.

Europe's share of the world market for information systems at all levels is only 15%, according to the European Commission. This decline is largely due to lower profits compared to U.S. and Japanese companies. The slippage is also the result of sluggish productivity and the difficulties of doing business within a nonhomogeneous domestic market.

None of these problems plague IBM, which once again appears to be virtually unassailable. Despite disappointing profits and European growth figures in 1981, Big Blue rebounded last year, with worldwide revenues up a respectable 18%. IBM also increased its European market share, and the company's European revenues, measured against the total turnovers of the Top 25 vendors, inched up to 40% last year, compared to 38% in 1981. (IBM's figures include revenue from all its business activities.)

AT&T'S WEAK MUSCLE

Meanwhile, another American giant, AT&T, has yet to make its marketing muscle felt in Europe. AT&T is in fact becoming one of the biggest ogres for the European press. Freed from its antitrust shackles, the technological titan is now mulling over how to establish itself in Europe. So far, the attempts appear fragmented and uncoordinated.

In Britain AT&T's Advanced Information System/Net One communications processing service will soon be started up. The company has also bought 45% of the Irish telecommunications outfit Telectron. Trouble, however, has been brewing ever since AT&T closed the operation's manufacturing plant.

A more worthwhile agreement with

FIG. 1

TOP REVENUE GROWTH RATES IN U.S. $

RANK 1982	RANK 1981	DP% GROWTH RATE*
1 **Ericsson Infor. Systems**	7	41
2 **Burroughs**	8	31
3 **Olivetti**	4	30
4 **Wang**	3	25
5 **ITT**	1	22
6 **Nixdorf**	-	17
7 **Hewlett-Packard**	6	13
8 **IBM**	-	10
9 **Philips**	-	10
10 **Digital Equipment**	2	8

*European revenue, FY 1982

FIG. 2

TOP REVENUE GROWTH RATES IN ACTUAL ACCOUNTING CURRENCIES

RANK 1982	RANK 1981	DP% GROWTH RATE*
1 **Ericsson Infor. Systems**	7	76
2 **Olivetti**	1	55
3 **Burroughs**	-	31
4 **Nixdorf**	8	25
5 **Wang**	4	25
6 **ITT**	2	22
7 **Philips**	-	18
8 **Kienzle**	-	16
9 **CIT Alcatel**	5	13
10 **Hewlett-Packard**	-	13

*European revenue FY 1982

FIG. 3

EUROPE'S TOP 15*

	COUNTRY	1982 EUROPEAN DP REVENUE IN $ MIL.
1 **Olivetti**	Italy	1,310
2 **Siemens**	W. Germany	1,270
3 **CII-Honeywell Bull**	France	1,200
4 **ICL**	U.K.	994
5 **Nixdorf**	W. Germany	796
6 **Philips**	Netherlands	787
7 **CIT Alcatel**	France	517
8 **Thompson-CSF**	France	299
9 **Ericsson Infor. Systems**	Sweden	287
10 **Kienzle**	W. Germany	247
11 **Triumph Adler**	W. Germany	204
12 **Plessey**	U.K.	204
13 **Ferranti**	U.K.	197
14 **CISI**	France	143
15 **CAP Gemini Sogeti**	France	125

*Companies owned and headquartered in Europe

Philips promises joint development and marketing of public switching gear throughout Europe. AT&T clearly needs a European-wide distribution network—a network that Philips certainly has. The Dutch company, seemingly unabashed by criticism over its "un-European" behavior, may even opt to extend the AT&T pact to cover other product areas.

Several continents away, Japan still has high hopes of scoring big sales on European soil. So far, those hopes have yet to become a reality. In-country collaborations, however, may indeed move it closer to those export goals. The Japanese have admittedly shown no lack of initiative and skill in forming cooperative deals with such major European and U.S. companies as ICL and Siemens (Fujitsu), Olivetti and BASF (Hitachi), IBM (Matsushita), Sperry (Mitsubishi), and Amdahl (Fujitsu).

Cooperation is also in the cards in Europe, if the EEC gets its way. Concerned about the European trade deficit in information technology goods and services, the commission has come up with Esprit, the poetic name for the European Strategic Program of Research in Information Technology. The program is a coordinated attempt to get research started on potentially high-risk, high-return projects. Larger, lower-risk projects will get 50% funding, with the remaining costs shared by participants.

More than $700 million will be spent on the ambitious program over the next five years. Research will be carried out on five "enabling technologies"—microelectronics, advanced software, advanced system engineering, office automation, and computer aided manufacturing.

Companies in the major European markets—U.K., France, and West Germany—hope to benefit from the EEC's Esprit effort. In the U.K., the liberalization of British Telecom has sparked a number of changes in telecommunications and dp markets. BT itself has restructured to face the demands of new markets and competitive threats. Four new BT divisions have been created, two of which involve new technology. The Merlin group sells small telephone exchanges and office automation systems such as word processors and micros (from ICL). The Spectrum operation offers add-on services such as BT Gold, an electronic mail service.

Despite the overhaul, there are fears that BT's liberalization will open up the marketplace to foreign suppliers, who may undercut indigenous manufacturers and fail to offer adequate levels of post-sales support.

On the U.K. vendor front, ICL proved during 1982, to some observers' surprise, it could operate at a profit. Turning a £50 million loss into a £24 million profit, given the sorry state of the U.K. economy, seems to prove that ICL has changed more than its logo.

Last year was Information Technology Year in Britain. Putting its money where its mouth was, the U.K. government promised that $320 million will be spent over the next five years to support the local information technology industry.

BRITAIN'S OFFICE SCHEME

As part of the Information Technology Year, the U.K. Department of Industry launched its office automation pilot scheme. Under the setup, government offices and public services have joined forces with manufacturers, with some national funding, to develop experimental office automation systems. The project gives local vendors a good opportunity to put the finishing touches on their office automation products.

Across the Channel in France there are also extensive plans to fund R&D and restructure the currently confused nationalized computer industry. The French government expects to spend around $1.6 billion over the next five years to revitalize the local electronics sector. The French, however, have repeatedly shown that they can't follow through on their gift for planning. Their scheme to mass-produce cheap facsimile machines for the home market, for example, failed because none of the chosen manufacturers could come up with a prototype that was low enough in cost. The electronic telephone directory is also proving more expensive than originally planned and installations are way behind schedule. Only a fraction of the planned fiber optic network in Biarritz will now be laid and that too will be late. Nevertheless, the planning and restructuring continues.

The Compagnie des Machines Bull (CMB), created as a holding company for the new Bull marketing group, will be the focal

DATAMATION'S EUROPEAN TOP 25

1982 RANK	COMPANY	1981 RANK	PARENT COMPANY HQ	EUROPEAN DP REV. CAL. YR. 1982 (IN $ MIL.)	% CHANGE EUROPEAN DP REV. FY 1981/2 (IN $)	% CHANGE EUROPEAN DP REV. FY 1981/2 (IN ACCOUNTING CURRENCIES)	DP REV. DOMESTIC (PARENT CO.) FY 1982 (IN $ MIL.)
1	IBM[1,2]	1	U.S.	9,747	+10.1	+10.1	10,028
2	Olivetti	6	Italy	1,310	+30.2	+54.9	*
3	Siemens	3	W. Germany	1,270	− 2.0	+ 3.4	571
4	CII-Honeywell Bull	2	France	1,200	− 8.5	+10.7	*
5	Digital Equipment	4	U.S.	1,041	+ 7.5	+ 7.5	2,497
6	ICL	5	U.K.	994	− 8.0	+ 2.0	745
7	Burroughs[3]	10	U.S.	970	+30.7	+30.7	2,448
8	Sperry	7	U.S.	813	− 4.2	− 4.2	*
9	Nixdorf	12	W. Germany	796	+17.4	+24.9	*
10	Control Data	8	U.S.	794	+ 3.7	+ 3.7	2,717
11	Philips[1]	9	Netherlands	787	+10.0	+18.0	*
12	NCR	11	U.S.	702	− 3.5	− 3.5	1,467
13	Hewlett-Packard	13	U.S.	694	+13.3	+13.3	1,194
14	CIT Alcatel	14	France	517	− 7.0	+13.3	*
15	Honeywell	15	U.S.	478	− 3.9	− 3.9	1,223
16	Thompson-CSF[4]	16	France	299	− 5.1	+14.8	*
17	Ericsson Infor. Systems	21	Sweden	287	+41.3	+76.0	*
18	Wang	23	U.S.	282	+24.8	+24.8	801
19	Kienzle	20	W. Germany	247	+ 7.3	+15.6	*
20	ITT	17	U.S.	220	+22.0	+22.0	*
21	Rank Xerox[1]	18	U.S.	211	− 3.7	− 3.7	*
22	Triumph Adler	N/A	W. Germany	204		*	79
23	Plessey[1]	22	U.K.	204	+ 0.4	+16.0	180
24	Ferranti	19	U.K.	197	− 4.3	+ 7.5	161
25	Data General	24	U.S.	155	− 6.0	− 6.0	570

N/A Not applicable *Not available [1] Estimate [2] Dp revenues include all activities [3] Figures for Europe include African revenues [4] Dp revenues include photocopiers

point of the French dp industry. The holding company will be responsible for brainstorming strategy plans for the entire group. CII-Honeywell Bull will also exist in a new form. Peripherals and office automation subsidiaries will be set up and minicomputer-maker Société Europeene de Mini-Informatique et de Systemes (SEMS) is being moved over to CMB from Thomson-CSF.

France also wants to strengthen its telecommunications industry but the government and the PTT cannot agree on just how this should be done. The government would like the former ITT subsidiary Compagnie Générale de Constructions Telephoniques (CGCT) to join forces with CIT Alcatel. The PTT, however, favors a merger between CGCT and Thompson-CSF.

Whatever the outcome, it is clear that the French dp industry is in trouble. None of the major French companies—CII-Honeywell Bull, CIT Alcatel, or Thompson-CSF—had a successful year in 1982. Their poor performance is mainly blamed on the dollar dilemma and the reorganization confusion.

France's neighbor, West Germany, found the going easier last year. Nevertheless, West Germany's flagship firm, Siemens, suffered an 8% drop in domestic revenue. The German giant, which has been in an extremely strong position in Europe for years, now seems to be under attack from its local rivals, namely, Nixdorf, Kienzle, and Triumph Adler—all of which had very good years in 1982. Part of their success was at the expense of Siemens, which has also been experiencing static sales worldwide.

While Siemens-watchers may be eyeing the future with caution, insiders at the German PTT are looking at the next few years with newfound optimism. One of the reasons for this optimism is Bigfon, the German PTT's broadband fiber optic network that's scheduled to be integrated into local telephone nets during the next three years.

Six German companies are involved in the seven-city network project, which will also provide videoconferencing and videotelephone facilities. Although the networks are being fully digitized, the Bundespost plans to use satellite links to meet the initial demand for broadband services.

While the Germans appear to be very active on the communications front, they seem to be more lackadaisical in the microcomputer realm. Across Europe, the micro made its mark in 1982. While some suppliers rushed to get their business systems into trade publications and onto show stands, others hurried to get their home computers into the stores by Christmas.

Britain, which is currently the largest European microcomputer market because of its strong contingent of Yankee vendors, will soon be overtaken by Germany, which is getting up to speed in the micro movement.

Only a handful of the largest companies in the DATAMATION Top 25 benefited from the microcomputer explosion during 1982. But this year, following the European introduction of the IBM and Digital Equipment personal computers, promises to be a very different story. IBM, for example, has already outsold Apple and Sirius to become the leading supplier of business micros.

The sales leaders in the European microcomputer market are still Commodore and Sinclair. So far, few indigenous European manufacturers have been successful in this market. The only possible exceptions may be Sinclair and Olivetti. So while the micro may be a sales opportunity that all the traditional dp vendors want to exploit, their ability to do just that is hampered by the fact that the competitive edge in this fledgling field can only be gained through marketing and not product ploys.

DP REV. WORLDWIDE FY 1982 (IN $ MIL.)	TOTAL REV. EUROPE FY 1982 (IN $ MIL.)	TOTAL REV. WORLDWIDE FY 1982 (IN $ MIL.)	% CHANGE TOTAL REV. WORLDWIDE FY 1981/2	TOTAL NET INCOME WORLDWIDE FY 1982 (IN $ MIL.)	% CHANGE TOTAL NET INCOME WORLDWIDE FY 1981/2	TOTAL WORLDWIDE EMPLOYEES	YEAR ENDING
34,364	9,747	34,364	+16.2	4,409	+ 33	364,796	Dec.
1,616	1,836	2,469	− 2.8	*	*	49,763	Dec.
1,270	11,430	16,980	+ 7.1	312	+ 33	324,000	Sept.
1,238	1,200	1,238	− 8.5	−205	−259	21,864	Dec.
3,880	1,006	3,880	+21.3	417	+ 21	68,000	June
1,304	982	1,304	−13.8	29	+124	23,581	Sept.
3,848	970	4,186	+23.0	117	− 22	62,000	Dec.
2,800	1,500	5,571	+ 2.6	221	− 29	88,000	Mar.
942	796	942	+10.0	*	*	16,017	Dec.
3,302	794	4,292	+ 3.0	155	− 9	56,005	Dec.
1,047	9,026	16,104	− 5.1	162	+ 13	336,800	Dec.
3,173	865	3,526	+ 2.7	234	+ 13	63,000	Dec.
2,212	1,334	4,254	+18.8	383	+ 25	67,500	Oct.
554	1,415	1,894	− 4.2	*	*	40,000	Dec.
1,684	1,022	5,490	+ 2.5	273	+ 5	94,100	Dec.
320	*	4,139	− 9.5	−327	+2,224	81,300	Dec.
387	287	387	+50.0	*	*	3,857	Dec.
1,159	246	1,159	+35.0	107	+ 37	21,480	June
276	356	396	− 1.5	*	*	9,172	Dec.
600	7,718	15,958	−30.0	702	+ 4	283,000	Dec.
*	*	8,450	− 1.0	423	− 29	114,000	Dec.
443	289	809	+ 1.0	*	*	11,246	Dec.
296	1,263	1,838	− 6.9	139	+ 7	42,929	Mar.
218	501	589	− 7.1	41	+ 8	5,967	Mar.
806	158	806	+ 9.5	25	− 51	15,210	Sept.

METHODOLOGY

Information for the European Top 25 was solicited through questionnaire. For the purposes of this survey, Europe was taken to include Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K. The following product areas were included in the definition of data processing:

- Mainframes, general purpose computers;
- Minis and Micros—computers with a minimum of system software—and small business systems and personal computers;
- Terminals and peripherals—all those connected, either directly or via data communications links, to a dp system;
- Software and services, including bureau services, database services, software packages, etc.;
- Data communications equipment, including data connections (modems and equivalent) and communications processors (multiplexors, concentrators); and
- Word processing equipment and electronic typewriters.

The following areas were not included: data transmission or basic services, specialized common carriers services, standalone magnetic card typewriters, standalone electronic cash registers, instrumentation equipment, semiconductors, printed circuit boards, automatic test equipment, and dp supplies (with the exception of magnetic media for disk and tape drives). All peripherals that attach to a dp system were included. For computer-based manufacturing systems such as computer-controlled machine tools, only the computer and hardcopy output devices were included, not the machine tool.

The main ranking was based on 1982 calendar year revenues (in U.S. dollars) from dp operations in Europe for each company. Figures for companies whose fiscal year did not end December 1982 were adjusted using published quarterly figures or estimates. All other figures appearing in this survey relate to the company's reported results of their fiscal year ending 1982. In the main table, all results have been converted to U.S. dollars, using OECD exchange rate statistics for the appropriate time period. An additional column showing growth rates in actual accounting currencies is included to compensate for the anomalies produced by fluctuating exchange rates.

The rank orders for 1981 are exactly the same as those published last year. Any inaccuracies in last year's table have been corrected and used for calculating the 1982 growth rates. Total revenue figures for Europe and worldwide refer to the parent company, where appropriate. When the parent company itself is not strongly involved in dp, the principal company has been considered as independent.

Inevitably, some of the figures in the table can only be estimates. In some cases the companies do not separate out their revenues into appropriate categories. Furthermore, while all companies were provided with the same definition for dp, it is impossible to verify the exact comparability of their calculations. Finally, three companies were either unable or unwilling to supply complete information for the survey, and estimates were therefore made on the basis of published information. These companies were Rank Xerox, Burroughs, and Plessey.

DATAMATION's European Top 25 survey was prepared by Logica, a London-based company that provides international market studies and reports to computer and telecommunications suppliers.

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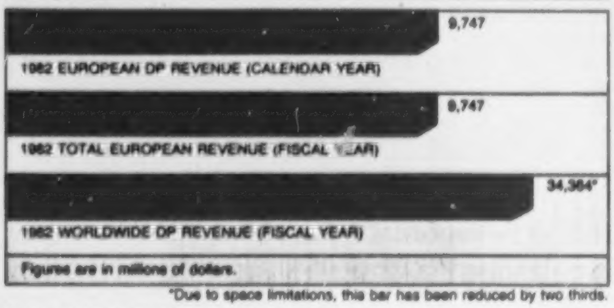

*Due to space limitations, this bar has been reduced by two thirds.

IBM EUROPE S.A.

5 –7 Cite du Retiro
75008 Paris, France

There is still no doubt that the number one position in the European dp market unassailably belongs to IBM. The company's European revenues rose a healthy 10% to $9.7 billion, in 1982, despite currency fluctuations and some softness in orders during the second half of the year. (IBM's figures include revenue from all its business activities.)

The continuing European slump nevertheless took its toll. IBM's European growth rate of 10% lags significantly behind its worldwide turnover increase of 18%. Bearing in mind last year's sluggish performance, IBM's 1982 results are, at best, a sign that the company has reversed the downward trend.

Business clearly did improve, however, in some countries, notably West Germany and the U.K. IBM made some progress with its U.K. subsidiary, which reported a 24% surge in revenues. Meanwhile, IBM Deutschland chalked up a 15% growth rate.

The new company structure, coupled with a more aggressive marketing strategy, produced noticeable changes last year in IBM's approach, especially at the low end of its product range. IBM launched advertising campaigns for its smaller systems and began offering more oem equipment. In an attempt to keep market share, IBM announced drastic price cuts of 5% to 35% on medium and small business systems last fall.

While IBM's mainframe business ticked over at an acceptable rate, much of the growth actually resulted from the marketing drive at the low end. Big Blue also booked several large advance orders—orders generated by U.S. sales of its Personal Computer. The P.C., however, did not officially arrive in Europe until the beginning of 1983. The unveiling came 17 months after the stateside launch because of bad production planning at the American end. IBM used the time to set up a third-party distribution network, which is still being completed, and to nationalize the machine and its software to meet the individual European market needs.

IBM also realized that it had to make it easy for European buyers, at all levels, to stretch their depressed budgets. To do that, the company established finance subsidiaries that offer leases on most equipment.

To help perpetuate its European image, IBM publicly announced that it is seeking partners in both national and European research ventures. Also in the works are partnerships with European companies and telecommunications authorities. Some observers feel these moves are inevitable since the company is certainly an integral part of the European dp community. Others fear the cooperative pacts are merely a prelude to the kind of acquisition drive that has recently given IBM strong stakes in chip maker Intel and telecommunications company Rolm.

CHARTS BY BARBARA KRAUS

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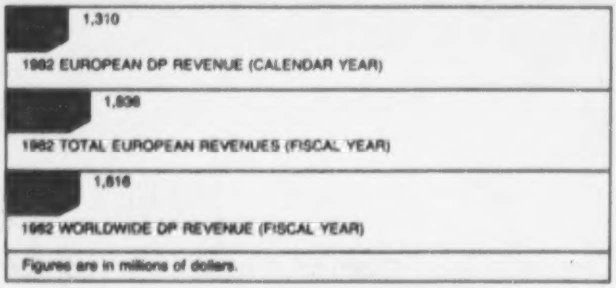

ING. C. OLIVETTI & CO. S.P.A.

Via Jervis 77
10015 Ivrea, Italy

Olivetti's claim of being Europe's leading indigenous manufacturer of distributed data processing (ddp) and office products now seems justified. In 1982 the Italian company once again achieved a spectacular growth rate (54% in lire) in its European dp and word processing revenues. This sales streak helped the firm leapfrog over both CII-Honeywell Bull and Siemens to reach the coveted number two position behind IBM in the DATAMATION Top 25.

This phenomenal growth is not all due to increased sales, however. Last year Olivetti consolidated in its results the turnover from three of its acquisitions—Hermes in Switzerland, Société Nouvelle Logabax (SNL) in France, and Data Terminal Systems in Germany. Nevertheless, the company is in a strong position, and last year it stepped up capital spending by 25% and its research and development costs went up to $85 million.

In addition to the gains made through takeovers, Olivetti has also benefited from increased sales of its electronic typewriters. Over the last few years the electronic typewriter has been one of the great success stories in the European business equipment market—a market in which Olivetti is the leader. The company hopes to repeat this success with its range of word processors and more advanced office systems.

While Olivetti continues to keep its manufacturing base in Italy, it also runs manufacturing operations out of its Hermes subsidiary in Switzerland and its SNL subsidiary in France. SNL is already proving a useful acquisition for Olivetti, winning the development contract for a point-of-sale (POS) terminal for the French telecommunications directorate.

New products released during 1982 included the Praxis 40 and 45 electronic typewriters, and the M30 and M40 ddp minicomputers for its Linea Uno (L1) range of systems. Olivetti has scored a major success with its L1 series, capturing a $60 million contract to automate the Danish savings banks. The system consists of up to 5,000 terminals and minis. The L1 series will also be used for pilot automation schemes in two banks in the U.K. In addition, Olivetti unveiled the M20 personal computer, which boasts a 16-bit processor and bus.

Olivetti's attempts to get a strong foothold in the European mainframe business, however, met with mixed success. The company still sells the Hitachi mainframes in Italy and Spain but was forced to close down its mainframe subsidiary in Britain because of a lack of interest. Nevertheless, in its more traditional business areas of office and ddp products, Olivetti seems well positioned to continue its recent success.

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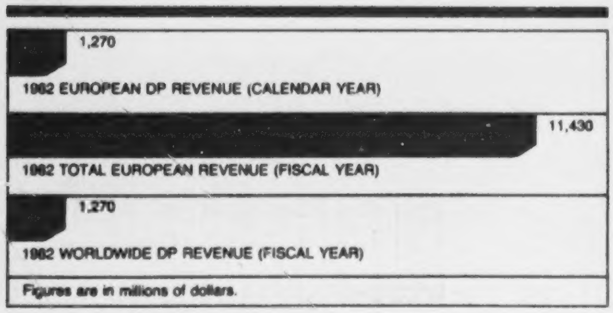

Figures are in millions of dollars.

SIEMENS AG

Wittlesbacherplatz 2
D-8000 Munich 2, West Germany

Although Siemens's European dp revenues fell 2% in terms of dollars, it still managed to hold on to third place in this year's Top 25. In fact, the Siemens group overall had an improved year, recording a 16% sales hike (in deutschemarks). The German giant also reversed the downward trend in its profits.

The firm's data systems division, however, is still losing money—although the losses piled up in 1981 were cut in half last year. Siemens remains confident that it can pull the business back into the black and insists that the division is "operationally healthy but suffers from some structural problems."

More vexing is Siemens's severe (8%) drop in domestic orders last year. That's distressing news for a company that depends on its home market for 45% of its business. An increase of 15% in international bookings offered a little compensation. Some of these orders came from Siemens's two most important European dp markets—Belgium and Italy.

During the year the Munich mainframer had to slim down to cope with the static demand caused by the recession. The work force was trimmed another 4% in 1982 and production only ran at 77% of capacity.

While further streamlining is still in the cards, Siemens doesn't believe this will prevent it from widening its horizons. Last year the firm signaled its intention to expand its U.S. presence by increasing its North American share of foreign capital investment from 17% to 41%.

The company also realizes that it must broaden its product spread if it is to survive. Like all the companies in the Top 25, Siemens is closely monitoring the office systems market. One of the world leaders in telecommunications, Siemens will capitalize on this strength in the office arena.

In early 1982 Siemens set up a new software division as part of its R&D program and signed a marketing agreement with Xerox to integrate the U.S. firm's systems into its line of PABXs. In return, Siemens will market Xerox office automation systems in West Germany, Austria, and Switzerland.

To help boost its marketing drive, Siemens declared that it will offer compatibility to IBM, Honeywell, Control Data, and Sperry mainframes on its range of terminals and small systems. Siemens, however, is still in trouble and all its carefully laid plans may suffer not because they are inherently misguided, but because the company's organizational structure may prevent them from being effectively implemented.

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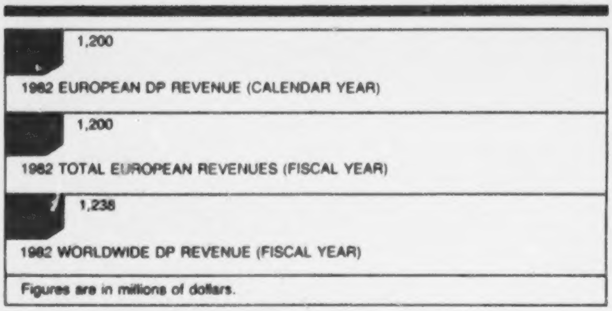

Figures are in millions of dollars.

CII-HONEYWELL BULL

94 Avenue Gambetta
75020 Paris, France

Last year was not a good year for CII-Honeywell Bull. While dp revenue increased in francs, it decreased 8.5% against the hardening U.S. dollar, plunging profits. This left CII-HB in fourth place—a drop of two places since 1981.

The company claims that production problems in the second half of 1982 caused delivery delays for products. This, combined with the burden of high internal R&D costs and undercapitalization, meant it incurred large debts and a FF1.35 billion net loss last year.

Business also suffered from the instability of the franc and the general lack of confidence in the French economy. In addition, the state reorganization of the French industry is still causing severe confusion and insecurity among suppliers and users alike. The strength of the home market is crucial to CII-HB's success, since it gets over half (57%) of its revenue from France.

Last year saw a new president at the helm—Jacques Stern, founder of French software company Société d'Etudes des Systemes d'Automation (SESA). Stern, who was brought in to revamp the company, established a plan of action that targets a compound growth rate of 17% up to 1986. By then he hopes CII-HB will be at the break-even point.

On the product side, Stern is going all out to keep CII-HB a broad-based company and he plans to expand the product line in all directions—ever more powerful machines at the top of the line, cheaper microcomputers at the bottom end, and generally more turnkey systems aimed at the end user.

Stern, along with other CII-HB top managers, is satisfied with the agreement reached with Honeywell in April 1982. Honeywell's stake in CII-Honeywell Bull was reduced from 47% to 19.9%, but the commercial and technical cooperation between them will continue for the next 10 years.

CII-HB, which is still the cornerstone of the ongoing French effort to nationalize and reorganize the local computer industry, is now part of a new group called Bull. Compagnie des Machines Bull (CMB) will remain the holding company and will be responsible for planning strategy for the whole Bull group. The group will be divided into four subsidiaries comprising CII-Honeywell Bull (for large and medium computer systems), SEMS (for minicomputers), and two other subsidiaries that will concentrate on peripherals and office automation (including Transac, which has been moved over from CIT Alcatel).

The French are determined that CMB will become a formidable national force in information technology by 1990. The French government is even more committed to this goal, since it has also increased its investment in the group to FF1.5 billion for 1983.

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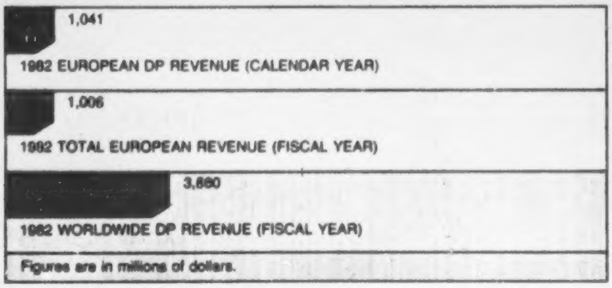

DIGITAL EQUIPMENT CORP. INTERNATIONAL EUROPE

12 Avenue des Morgines
CP 510, CH 1213 Petit-Lancy 1
Geneva, Switzerland

Digital Equipment Corp. maintained its position as the second largest U.S. company operating in Europe during 1982, its 25th anniversary. The company, which now prefers to be called Digital, chalked up a 7.5% revenue increase in its European business.

Outside Europe the news was not so good. While fiscal year revenues and profits for the company as a whole were well up over the previous year, it reported a 38% drop in net income on a 7.6% rise in worldwide revenues during the last six months of 1982. This marks the halt of the steady growth pattern that Digital has displayed over the last 10 years.

Europe remains an important arena for Digital, which has recently built major offices in France, West Germany, and the U.K. The company has also consolidated its manufacturing base in Britain.

The company's main problem, however, is still its distribution network. In an attempt to rationalize its dealership agreements in Europe, Digital introduced new schemes that upset many dealers. The company was criticized for trying to monopolize key vertical markets in some countries. A flurry of price cuts also caused consternation among dealers, who felt that the company was trying to take business away from them. The situation, which is still not completely resolved, could affect Digital's 1983 position.

Last year the company debuted several new versions of its PDP processor, coming out with various microcomputers as well as the Correspondent portable terminal. Digital also unveiled the new entry-level VAX 11/730, a cheap, 32-bit superminicomputer. Announced last year in the U.S. and considered to be powerful and competitive products, Digital's personal computers were not available in Europe until this past March.

Digital claims to be broadening its product perspective in an attempt to become more of a total systems company. It has committed itself to Ethernet and will increasingly market equipment with Ethernet interfaces within its own network architecture, DECnet. It also intends to introduce a gateway from DECnet into IBM's SNA, a move designed to boost sales of its Office Plus system.

Digital is being rocked by the recession and depressed capital equipment markets. Its PDP business is dying much faster than anticipated and the development and startup costs for new products, such as the VAX 11/730 and the personal computers, were a big financial burden. The heavy advertising and marketing costs for the personal computers launched at the end of 1982 will also have an adverse effect on profits for 1983.

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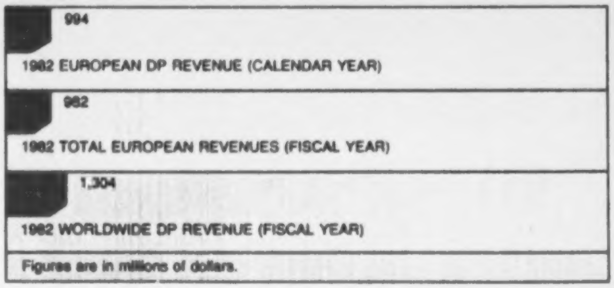

ICL PLC

Bridge House
Putney Bridge, Fulham
London SW6 3JX England

As the new management team of Robb Wilmot and Chris Laidlaw had promised, ICL did indeed show a profit for 1982. Yet this was not due to a miraculous upsurge of revenue, but to hefty cost savings and some clever financial management. The profits also included a number of extraordinary items that cannot be repeated so the company is not out of the woods yet.

Down one notch in the rankings, ICL is, however, on a much sounder financial footing than it was last year. It has significantly reduced its borrowing commitments and halted the drastic decline in revenues. Given the generally depressed state of the European computer business in 1982, ICL's 2% increase (in pounds sterling) in dp revenue, coupled with its £24 million pretax profit, is encouraging. But some bothersome trends were hidden in these results. One particularly bad omen was the 9.1% drop in business to EEC countries.

The company's cost-cutting drive also had some adverse effects. Staffing levels were drastically reduced, and some observers feel the cutbacks will jeopardize user support and future development.

On the product front, ICL is trying to spread its manufacturing wings and get back into business as a systems supplier. To expand its product range and avoid heavy development costs, the company is collaborating with many companies for both hardware and software: Fujitsu for VLSI chips and Facom mainframes, Rair for its personal computer, Three Rivers for its Perq scientific workstation, and Logica VTS for its DRS word processor. The U.K. firm has also agreed to market Mitel's (Canada) SX2000 telephone switch, which is bogged down by severe delivery delays—a situation that clearly illustrates ICL's vulnerability in such deals.

Having been repeatedly rescued by the British government, the company is now hoping to win government business on merit, rather than by favoritism. At the same time, however, it says it wants virtually the same type of procurement support that other national governments dole out to their local vendors.

In a more independent vein, ICL adopted a number of new marketing strategies last year. It introduced the Networked Product Line, a concept that it hopes will show just how easy it is to link its equipment. ICL also tried to sharpen its marketing approach, setting up Computer Point and Trader Point centers. Computer Point centers handle local direct sales, while Trader Point sites serve as third-party distribution channels.

Last year was a time of transition for ICL. Apart from some obvious success in financial management, most of the revitalized product and marketing strategy has yet to be proved, which makes 1983 yet another make-or-break year for the British company.

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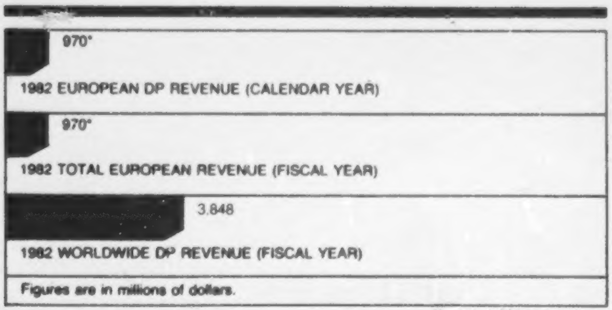

*Includes African revenues

BURROUGHS CORP.

Heathrow House, Bath Road
Cranford Middlesex, England

Burroughs vaulted three places in this year's Top 25 thanks mostly to the Memorex meld. It's also worth noting that the company's figures include African revenues, estimated at 15%, which still earn Burroughs the number seven slot.

Nevertheless, the U.S.-based company's 1982 results were not as good as had been hoped. During the last quarter of '82 profits were drastically cut to allow excess stock write-offs and to rationalize the company's overall operations. Despite this profit dip, Burroughs watchers believe the company is back on the track again.

The Memorex takeover has greatly expanded Burroughs's operations, providing it with a broader European marketing base and more peripherals muscle. While the company has been extending its European reach, it's been cutting back on the home front, where it slashed staff and closed plants. The streamlining was part of the massive reorganization campaign instituted by chairman Michael Blumenthal, who is determined to achieve a turnaround at Burroughs.

To boost business, Burroughs came out with various new and updated products in 1982. While still shying away from a full-fledged personal computer offering, the company did begin to market the B20, a 16-bit business microcomputer built by Convergent Technologies. A smaller but more powerful business system, the B96, which is built in Scotland, was also announced last year, along with the B4955 medium-size mainframe.

On the software side, Burroughs last year unveiled the LINC applications software generator, which it developed in conjunction with Future Systems, a New Zealand company. At the beginning of this year, the company had booked over 200 orders worldwide for the powerful applications generator. Also last year, Burroughs's OFIS 1 office automation system was selected for the pilot OA project run by the U.K. Department of Industry.

While Burroughs will obviously benefit from Memorex's sizable European business, it should also gain more peripherals power through a development agreement the California company inked with Intel. This deal will provide Burroughs with high-speed storage systems.

Sore spots still linger, however. The most persistently nagging problems concern its much-maligned delivery schedules and equipment maintenance operations. In an effort to stem this criticism, Burroughs has established independent sales outlets (ISOs). But only time will tell whether this approach will satisfy the needs of its increasingly diversified customer base.

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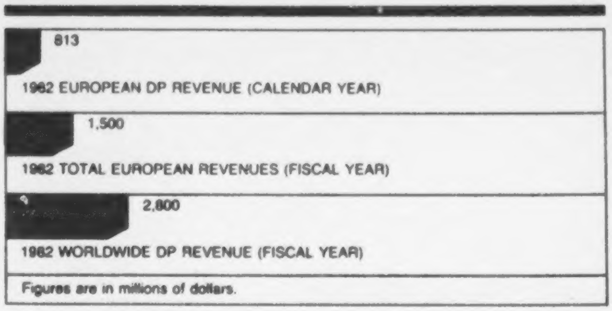

SPERRY CORP.

International Division, Computer Systems
P.O. Box 500
Blue Bell, PA 19424, U.S.

Last year was hardly a blue-ribbon year for the Blue Bell, Pa., mainframer, which dropped one rung down the Top 25 ladder. While worldwide revenue inched up 2.6%, European dp revenue fell 4.2%—a situation Sperry blames mainly on currency fluctuations. The company's worldwide profits in FY '82 plummeted 29% and quarterly returns for late 1982 and early 1983 show the slide continuing.

Industry analysts peg Sperry's current problems squarely on its product lines, which suffer from a narrow hardware focus. While sales of the Univac 1100 mainframes, Sperry's traditional backbone series, remained strong, its other products, such as the System 80 and System 90, didn't do so well. Still in the mainframe mold, the company took the wraps off the 1100/90 series, its most powerful processor line, last year.

At the lower end of the line, Sperry added the ubiquitous CP/M operating system to its terminal wares, counting on this move to pull it into the personal computer arena. Its answer to office automation needs is the Sperrylink system. Announced worldwide in November 1982, the system is centered around a 16-bit minicomputer that supports up to eight UTS 40 terminals.

The real Sperry link, however, may indeed come from its newfound ties with outside vendors. Chief among these hardware hookups is its agreement with Mitsubishi—a deal that is expected to bear fruit in the form of a new mainframe and personal computer. Early this year Sperry also teamed up with Magnetic Peripherals, the Control Data-Honeywell venture, to explore mass storage technologies.

In the networking realm, Sperry is expected to join the growing legion of vendors vowing support for SNA. In Europe the company has strengthened its networking muscle, becoming the first major manufacturer to win approval to attach its data communications gear to the German, Scandinavian, and British public data networks.

This good news hasn't apparently crossed the Atlantic, where the U.S. company has not been trading successfully. To build its stock prices as well as sales, the company is trying to shape a new image. As part of that plan, it's dropped Univac, the name of the first commercial computer. Observers decried the move, which they claimed was just one more lamentable sign of the times at Sperry.

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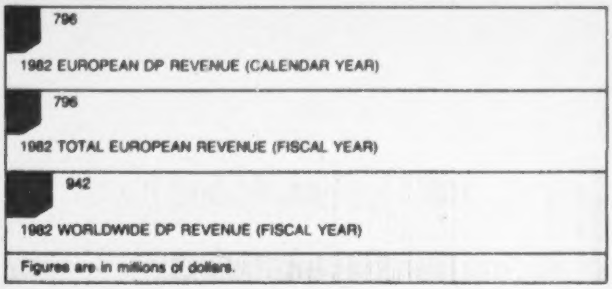

NIXDORF COMPUTER AG

Furstenallee 7
4790 Paderborn, West Germany

The good performance of Nixdorf in a depressed year means that West Germany can now claim two companies in the top 10 contingent. The impressive 25% (in deutschemarks) revenue rise moved the firm up three places in the European Top 25. This surge resulted from stepped-up business, rather than from takeover schemes—the major factor in Burroughs's boost.

The German firm is indeed doing well, so well, in fact, that at a time when so many industry companies are laying off employees, Nixdorf has hiked its staffing levels 10%. It has also strengthened its manufacturing might, opening new facilities in West Germany and Spain. (The company's only manufacturing operations outside Germany are in Spain and Ireland.)

Nixdorf's home base, West Germany, accounted for 54% of the company's dp revenues. France, with 12%, and Spain, with 7%, were its next most important markets. The company also made a big push into the U.K. market and managed to turn a profit in the U.S. for the first time.

The company's IBM compatible midrange computers and business systems are complemented by its 8864 banking system that's used throughout Europe. The system has helped Nixdorf capture several large orders from U.K. banks and building societies.

Nixdorf also hopes to repeat its success in the British market with its 8860 distributed data processing (ddp) range and its 8890 small mainframe series—both of which area already available in Germany.

Nixdorf was an early starter in the office systems market, and its 8840 word processing system has been available for a number of years. In addition, it is developing an office communications system. The system, which integrates voice, text, data, and graphics, is reportedly on trial in a number of pilot installations. Nixdorf, which recently committed itself to Xerox's Ethernet, is expected to introduce a local area network.

The company clearly sees communications as a key element in its strategy. It has set up a new telecommunications division and recently introduced its first digital PABX, the 8818, on the German market.

The overall growth in European business last year caused Nixdorf to restructure its marketing and support organizations. The company now has three European regions. The northern region, headquartered in the U.K., covers Britain, Scandinavia, and the Benelux countries. The central region handles Austria and Switzerland, while the southern division takes care of France, Greece, Italy, and Spain.

There is, as always, the possibility that the Nixdorf family will allow the company to go public, but as yet they seem content to let their investment thrive.

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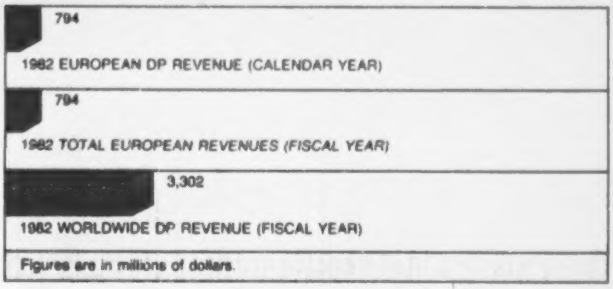


CONTROL DATA CORP.

7600 France Avenue South
Minneapolis, MN 55440, U.S.

Control Data did not score the same success in Europe in 1982 as it did the previous year, dropping two places in the DATAMATION Top 25. Supplanted by Burroughs and Nixdorf—both of which achieved impressive growth—CDC only managed a 3.7% increase in European dp revenue, the same total revenue rise it earned worldwide.

Overall profits at CDC slumped 9%. This decline is generally attributed to slackening oem sales of peripheral equipment, an area IBM appears to be moving into in a big way.

That can only be bad news for CDC, despite the company's relaxed attitude toward its rivals. In fact, it has forged alliances with some of those competitors, namely ICL, NCR, and Honeywell. It has also come to the rescue of such industry companies as Centronics, picking up a 45% stake in the ailing company in early 1982. Centronics thus joins CDC's growing stable of peripherals suppliers, which now includes Computer Peripherals, Magnetic Peripherals, and United Peripherals.

Control Data has also teamed up with Dutch giant Philips for optical disk drives and other media. The company already has a large media market share. Its factory in Wales, for example, is one of the largest magnetic media plants in Europe.

More recently Control Data took a 38% stake in Systime, the U.K. minicomputer maker that competes with Digital. CDC followed up this investment with the takeover of Arbat, a British systems house specializing in banking systems.

CDC was also the driving force behind the newly launched Microelectronics and Computer Technology Corp. (MCC), a venture that hopes to compete with Japanese companies in research and development. MCC is backed by other big manufacturers such as Digital, Motorola, Harris, NCR, Sperry, and Honeywell.

Control Data's acquisitions and associations over so wide a field mean that it runs a serious risk of losing its sense of identity as a company and therefore its raison d'être.

11

PHILIPS GLOEILAMPENFABRIEKEN

Data Systems Division
P.O. Box 242
7300 AE Apeldoorn
The Netherlands

Business was good again for Philips's Data Systems Division, which reported a 10% revenue increase in dollars over 1981. (This growth estimate is derived from adjusted 1981 figures.) The Dutch company sees itself primarily as a systems house, producing a whole range of computer wares. One of the oldest firms in Europe, Philips has a formidable presence in that market. In fact, 76% of its dp revenue is derived from Europe, although this represents only 5% of the multinational's total worldwide take.

Philips has won an increased share of the word processor market and its PTS 6000 financial transaction terminal seems to be doing well in the banking sector. Last year the company came out with various new products: the P3000 multistation microcomputer family, and the P3500 personal computer that features networking facilities.

Last year also saw the introduction of the P4200 business information system, which will be peddled by local distributors. This marketing approach will be used more extensively by Philips in years to come. Indeed, the company wants 50% of its dp revenue to come through indirect sales by independents such as third party outfits and retail outlets.

Another interesting move, which may eventually catapult Philips into more direct competition with IBM, came at the end of last year, when the Dutch company allied itself with American telecommunications giant AT&T. The agreement, which will provide Philips with the needed telecom expertise, gives AT&T a well-established customer base that can serve as a gateway into international markets.

Just how advantageous this alliance will be is still open to question, since many details still have to be worked out between the two powerful companies. In the meantime, Philips has some housecleaning of its own to do. The large conglomerate's overburdened and unwieldy internal structure has resulted in a lack of coordination throughout its product line. To help remedy this, Philips has set up an experimental organization in the U.K. to integrate its products—integration that will lay the groundwork for the firm's entry into the office systems field.

12

NCR CORP.

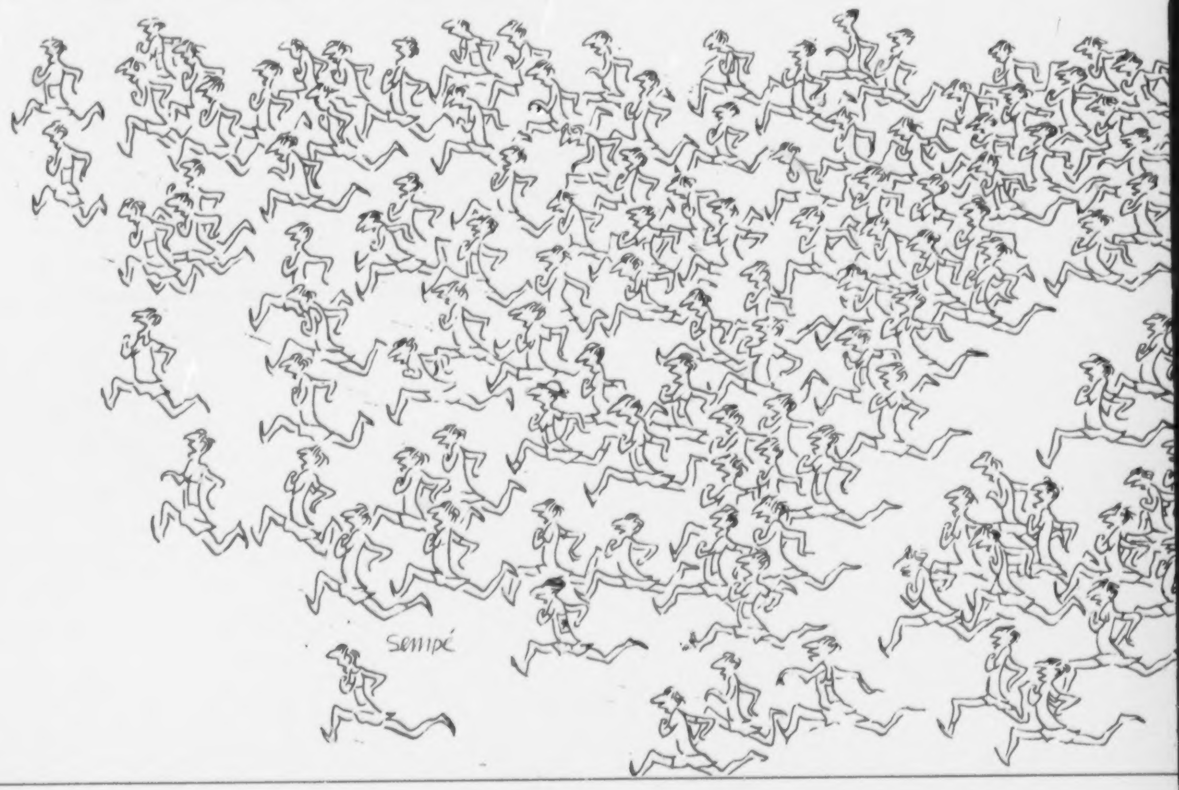
1700 South Patterson Blvd.
Dayton, OH 45479, U.S.

NCR's European turnover continued to slide in 1982, despite worldwide gains in total revenue and profits. Dropping down one place in this year's Top 25, NCR suffered from the same sluggish sales syndrome that afflicted it in 1981. Indeed, its worldwide increases are chiefly due to cost-cutting schemes and production facility improvements.

Coming off the production lines last year were a wide range of wares that helped expand the company's product portfolio. Some of those products were aimed at NCR's traditional market focus—the retail, financial, and commercial industries. A hotel management system and an airline reservation system based on prototype self-service terminals were among them.

NCR also introduced its 9010, a multipurpose microcomputer that can function as a personal computer, small business system, remote terminal, or a scientific workstation. After the 9010's debut, the U.S. company made further micro moves, coming out with the Decision Mate V personal business computer. This system, along with the company's Tower minicomputer, is manufactured in Augsburg, West Germany.

Across the border in France, NCR is looking for software and services companies to supply systems to small- and medium-size businesses. Also on the software side, the firm released last year a new word processing package that will run on its full line of computers. Advancing toward the future micro mainframe market, NCR hopes for an edge with its 32-bit universal emulator chip set.



13

HEWLETT-PACKARD S.A.

Route du Nant-d'Avril 150
CH 1217 Meyrin 2
Geneva, Switzerland

Europe was once again a fertile field for sales for Hewlett-Packard, which chalked up growth of more than 20% in local currencies. The California company, which likes to think of itself as a European firm, manufactures equipment, develops software, and carries out R&D work in Europe for local customers.

During 1982 HP continued to expand its manufacturing and R&D facilities in West Germany, France, and the U.K. All three countries are equally important to Hewlett-Packard, since 60% of its European revenues come from these markets.

Starting out in the instrumentation business, Hewlett-Packard has maintained its scientific computing slant in the dp arena. Nevertheless, the company's 1982 product releases reflected HP's awareness of the need to broaden its base. Last year the company hit the market with the HP-75, a portable battery-powered computer that can also function as a remote terminal. The HP 9000 family, which includes a desktop model with 32-bit mainframe power, was also unveiled.

HP also continued to focus on the lower end, inking a deal with Sony to use that company's 3½-inch disk drive on its line of personal computers. Hewlett-Packard is counting on the microfloppy drive becoming a de facto industry standard. It's also obviously counting on getting more customers for its personal computer range—not an unreasonable expectation, since HP's sales in this sector accounted for nearly one quarter of its worldwide dp revenues last year.

14

CIT ALCATEL

33 Rue Emeriau
75015 Paris, France

While CIT Alcatel has remained steady in the DATAMATION Top 25 for the past two years, this appears to be the last year the French firm will show up in these European rankings. Under the French government's program to nationalize and reorganize the local dp industry, Alcatel Electronique's most important subsidiary—Transac—has been transferred over to the new Bull group formed around CII-Honeywell Bull. The French reorganizers also decided that the company's remaining dp offshoots, terminal supplier Sintra and computer services vendor GSI, don't generate enough revenue to keep the Alcatel group in the big league. (Note that CIT Alcatel's dp revenues in dollars continued to slump in 1982, despite strong sales by Transac.)

The Transac section of Alcatel, which employs approximately 1,700 people, hauls in revenues of around FF 600 million, making it the largest terminal maker in France. It is also considered the largest manufacturer of automated teller machines (ATMs) in Europe. Such statistics are well known by Alcatel insiders, who bemoan the Transac spinoff.

With Transac farmed out to Bull, the Alcatel group will now concentrate its efforts on telecommunications, especially the office automation side. The French government indeed hopes that Alcatel will quickly get over the Transac loss and work hard to become the major French firm in OA telecom. Alcatel's Telic subsidiary has already had some initial success on that front, having become the major videotex supplier to the French PTT. Manufacturing at full tilt, Telic is currently shipping 1,500 terminals a day to the PTT.

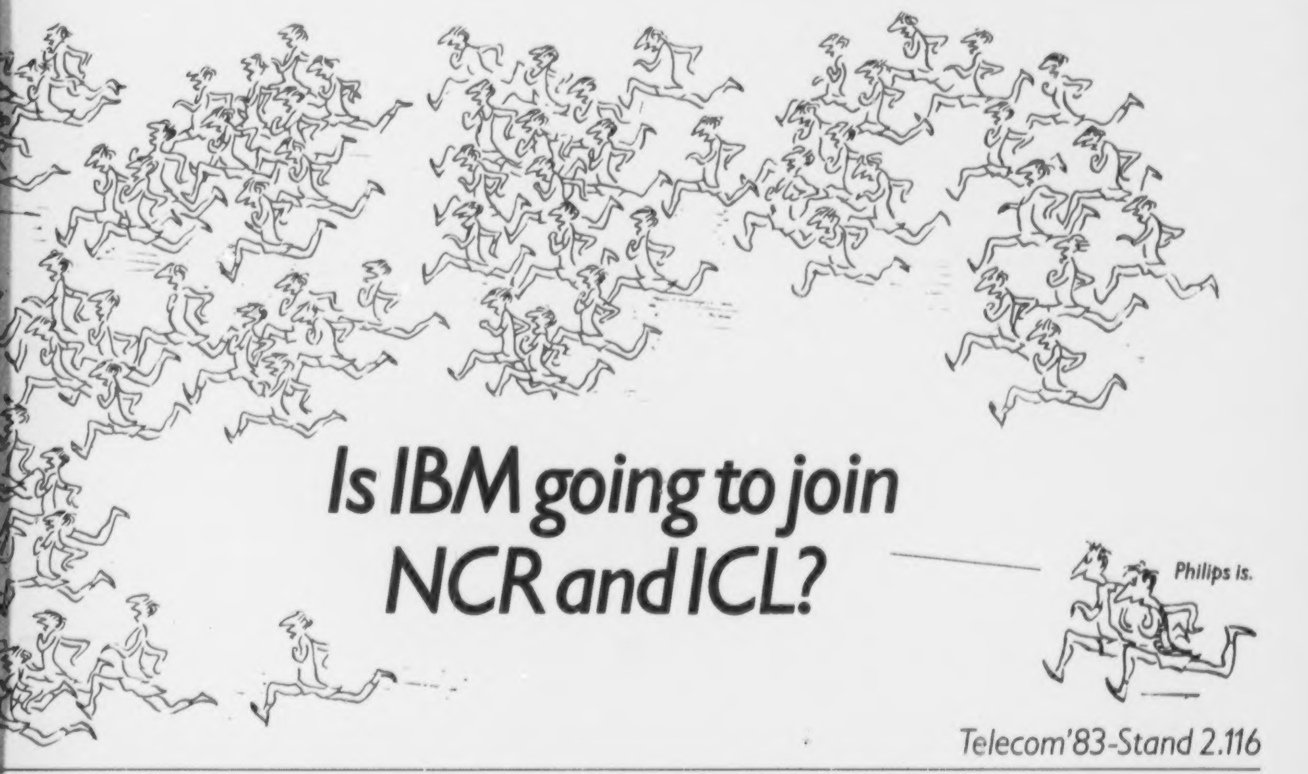
15

HONEYWELL INC.

Honeywell Plaza
Minneapolis, MN 55408, U.S.

Computer orders at Honeywell Information Systems fell off substantially last year, plunging profits 50%. But the Minnesota mainframer managed to hold on to 15th place, despite a drop in European dp revenues.

Two sellouts had a major impact on the company's net income last year. In the States, Honeywell got rid of its 16% interest in the services firm Geisco, and in France it reduced its stake in the nationalized CII-Honeywell Bull to 19.9%. Under a 10-year agree-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ment, both companies will continue to market their common product lines, cooperating on R&D efforts that are mutually beneficial.

Although operating independently, Honeywell Information Systems' two European subsidiaries—HIS Ltd. (U.K.) and HIS Italia (HISI)—work together closely on marketing the DPS4 small business computer, which is manufactured in Italy. U.K.-produced machines include the DPS6 minicomputers and the large DPS8 computer systems.

Still larger machines rolled off production lines in the U.S. last year following the worldwide announcement of the DPS88 VLSI computer series. Competing with IBM's big 3081s and 3083s, Honeywell's new supercomputers will support the company's DSA network architecture.

Honeywell claims to be winning replacement orders in the U.K. on the strength of DSA—orders that local manufacturers have been anxious to capture. If this is true, HIS will need a lot more of those orders to bolster its sagging sales.

16
THOMSON-CSF

173, Boulevard Haussmann
75008 Paris, France

In 1982 Thomson-CSF reported a consolidated loss that was roughly equivalent to its 8% rise in total turnover. While the troubled company's revenues in French francs actually rose, there can be no doubt that Thomson is facing some tough financial times.

SEND UP BRIDGELY, FROM ACCOUNTING.
S. Harris

CARTOON BY SID HARRIS

What happened to Thomson-CSF in 1982 happened to most companies in the French dp world last year—the government-mandated reorganization finally became a reality. For Thomson that meant most of its dp operations were taken away. Late last year it was announced that the new Bull group formed around CII-Honeywell Bull would be taking over Société Europeene de Mini-Informatique et de Systemes (SEMS), Thomson's minicomputer arm. (Under the new setup, SEMS will continue to market the Mitra and Sola family of minicomputers.) Also transferred to Bull was DAP, Thomson's terminal subsidiary.

What Thomson seems to be left with is semiconductors. The French government clearly wants the company on the semi scene and has pointedly told it not to renege on its development deal with Matra. During the year Thomson also completed a deal with Convergent Technologies to market that company's workstation. As a result of its one-third interest in Fortune Systems in the U.S., it also launched the Micromega 32 desktop microcomputer.

French followers believe that the reorganization and the accompanying feelings of uncertainty severely hurt Thomson's business last year. The same was true for CII-Honeywell Bull. But unlike the mainframer, Thomson, stripped of its chief subsidiaries, is not likely to turn up in the ranks of the Top 25 next year.

17
ERICSSON INFORMATION SYSTEMS

S-161 83 Bromma, Sweden

While Ericsson Information Systems (EIS) is a new name in the Top 25, it's actually not a new entrant in the rankings, because a large amount of the company's dp revenue comes from its takeover of Datasaab, which held the 21st slot in 1981. The Scandinavian company reported strong growth during 1982, but its organizational changes make its actual performance difficult to track.

The 1981 linkup of Datasaab with LM Ericsson, the world's fourth largest maker of telephone equipment, seems to have benefited both companies. Combining forces, the new EIS operation has expertise in minicomputers, terminals, data communications, and computer services.

To make sure it has a winning combination, the company is opening up wholly owned subsidiaries in several European countries. Across the Atlantic, EIS plans to expand its American business in hopes of becoming a direct rival to IBM and AT&T. Such competitive drives may be a bit premature, since the company has yet to make a substantial dent in the more germane European market, where 44% of its revenue is still earned on Swedish soil.

To capture more of those European sales, EIS enhanced its Alfaskop 41 terminal line by adding personal computing and word processing capabilities. It also came out with a color graphics model. Waiting in the wings is a 16-bit personal computer—a product the company is itching to introduce. The Series 16 minicomputer range was also beefed up with extra data communications facilities. (Exports of the Series 16 minis are reportedly up 20%.)

EIS wants to be a major player in the office automation arena, hoping that by 1990, sales in this sector will match revenues generated by its successful telecom business. To help ensure this, Ericsson acquired local firm Facit from Electrolux at the end of last year. It's also counting on capitalizing on its product strength in digital exchanges, electronic mail, and teletex to give it an edge in the increasingly competitive office telecommunications market.

18

WANG LABORATORIES INC.

Wang House, 661 London Rd.
Isleworth, Middlesex,
TW7 4EH England

Making its debut in last year's Top 25, Wang vaulted five places in this year's European rankings. European dp sales shot up a record 25%, with total worldwide revenues soaring 35%.

Wang won a strong and loyal following in Europe last year, turning 1981's $6 million loss into an $8 million profit. Business is indeed booming—so much so that the Massachusetts manufacturer's sales are far outstripping its ability to service and support its ever-expanding European customer base. Wang would like to see a slowdown in European sales, a tapering off of business that would buy it time to get its user support operation up to speed.

Nonetheless, the company, which claims to be a leader in the European office automation arena, is proud of the progress it's made. Its popular line of word processors and minicomputer-based business systems scored especially well in the U.K. market, which accounted for one quarter of its European revenues last year.

(Wang hopes to resolve the resulting service-support problem in Britain this year by beefing up spending in this area by more than 80%.)

Wang is also increasing its manufacturing base in Europe. Last year the company announced plans to step up equipment manufacturing at its Irish plant and also declared its intention to build a new facility in Scotland. Slated to go into production by next April, the Scottish plant will be located near Stirling University, which will collaborate with Wang on research.

19

KIENZLE APPARATE GMBH

Postfach 1640
D-7730 VS-Villingen, West Germany

A respectable 15% increase in dp revenues moved Kienzle up one notch in this year's survey. This solid performance meant that 62% of the company's total revenue stemmed from dp sales, compared to 51% in 1981.

The Black Forest firm, which has subsidiaries scattered throughout Europe, still does most (56%) of its business locally. The next largest markets to Germany are Britain (14%) and France (10%). Specializing in small- and medium-size computers, Kienzle derives the majority (43%) of its dp revenues from sales of minicomputers and microcomputers. Another 21% comes from the sale of software and services.

Attempting to coordinate its far-flung product line, Kienzle concentrated on one major system in 1982—the 9000 series of small business computers. Integrating text and dp functions, the systems run on a common operating system for program portability. The 9000 series also features Kinet, a networking tool that enables the systems to be linked to other mainframes (IBM, Honeywell, Siemens, or Sperry), as well as to public nets.

In April 1982 Kienzle became a whol-

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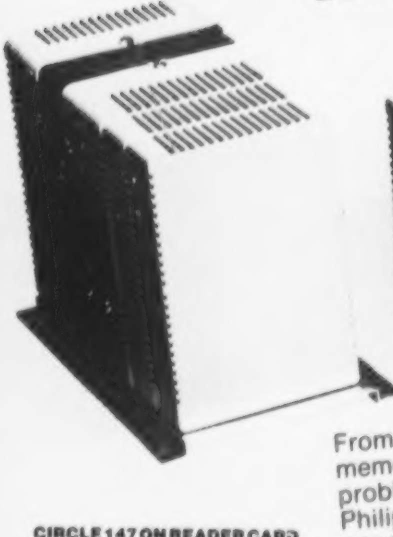

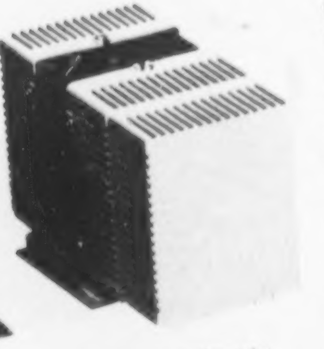

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ly owned subsidiary of Mannesmann AG. The German steel giant, which previously took over Tally, now has two companies on its dp team. Only time will tell, however, whether the Mannesmann meld will pay off for Kienzle, which is hoping to score significantly more sales on the European dp scene.

20

ITT EUROPE INC.

Avenue Louise 480
B-1050 Brussels, Belgium

ITT's European dp revenues, which rose 22% in 1982, were still not high enough to keep it in the number 17 position it held last year. Nevertheless, ITT's dp subsidiaries in Europe did much better than the corporation as a whole, which posted a 30% decrease in worldwide revenues on 4% profits.

Last year the U.S. conglomerate seemed to be on a sales spree, selling off its French subsidiary, Compagnie Générale de Constructions Téléphoniques (CGCT), and offloading its majority stake in British company Standard Telephone & Cables (STC). Finally resolving its wrangle with the French government over CGCT, ITT sold its troublesome affiliate to the French for $50 million—13% below its asking price. Meanwhile, under the STC buy-out, ITT still retains a minority (33%) interest in the U.K. company, which hopes to build its British image while benefiting from ITT's technological muscle.

Getting the jump on some of its American rivals, ITT unveiled its microcomputer, the ITT 3030, at the beginning of 1982. The machine was developed and manufactured in-house in West Germany. Other products announced last year included a new IBM-compatible front-end communications processor, computer-controlled message switches (the ADX 6100 and ADX 6200), and enhancements for its Courier 3280 clustered display system.

Terminals are a big part of ITT's business. In fact, two thirds of its European dp revenue stems from sales of terminals and peripherals. The remaining revenue is split between data communications gear (15%), minicomputers and microcomputers (7%), software and services (7%), and switching equipment (5%). Historically strong on the telecom side, ITT plans on keeping that strength up. To help do that, it set up a European datacom center in Britain the middle of this year.

21

RANK XEROX LTD.

Rank Xerox House
388 Euston Road
London NW1 3BH, England

Although Xerox does not break down its revenues by product or geographic region, the company's worldwide sales were down 1% and profits plummeted a spectacular 29%. And while Rank Xerox actually had a 6% hike in revenues, its profits were down a disturbing 50% compared to 1981. The ailing company's downward spiral is reflected in the Top 25 rankings, where Xerox shows up in the 21st niche, down three places from last year.

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Xerox's sales slump was exacerbated by slow business on the office automation front. Last year's losses in the office products area are in fact expected to be even heavier than in 1981. Such discouraging news prompted some industry analysts to speculate that the copier king had indeed given up on the office automation field. These fears were further fueled when two key Xerox office strategists resigned. Responding to the rumors, Xerox denied it was bolting the OA business.

To help it bolster that flagging business, Xerox teamed up with West Germany's Siemens in 1981. Under the oem pact, Siemens will market various Xerox wares—including Ethernet products and the 8000 line of workstations—in Germany, Austria, and Switzerland. In return, Siemens will integrate its PABXs into the Xerox systems line.

Xerox claims the Siemens linkup will accelerate the development of its integrated office systems line. Xerox, big in the research realm, has always stressed its development work. Ethernet, its local area network (LAN) offering, is a prime example. While Ethernet continues to attract support, it still hasn't been accepted as the definitive (not de facto) standard.

If Ethernet wins the standards war, Xerox still faces an even bigger battle in the marketplace. A pioneer in the development field, Xerox hasn't yet learned how to translate success in the office systems research realm into success on the sales side.

22

TRIUMPH ADLER AG

Office and Information
System Division
Furtherstrasse 212
8500 Nuremberg,
West Germany

Strong sales of electronic typewriters helped catapult Triumph Adler into the ranks of the Top 25 this year. Electronic typewriters and word processing equipment accounted for 50% of 1982 dp revenues, while business computer systems chipped in 20% and microcomputers 10%.

The Volkswagen subsidiary derives 36% of its total revenue from Europe. Its major market is Germany, where it pulls in 45% of its dp sales. It also has affiliates in France, Italy, Britain, and the Netherlands. The bulk (57%) of TA's total turnover comes from the U.S., where it has been operating for some time. Interestingly, TA is the only company in the Top 25 that earns most of its revenue through dealers—it has 15,000 dealerships worldwide.

Triumph Adler's system line includes the TA1600 office computer for small to mid-sized businesses and the Alphatronic microcomputer. The company is also well known for its Bitsy screen-oriented word processing system.

After a disappointing year in 1981, the TA group underwent a DM61 million reorganization, slashing its work force by 3,000. It also overhauled its manufacturing operations in Germany and Scotland. VW doled out funds to several of the group's European subsidiaries in a bid for profitability by 1984. The money will be used to improve sales, support, and marketing activities.

23

THE PLESSEY CO. PLC

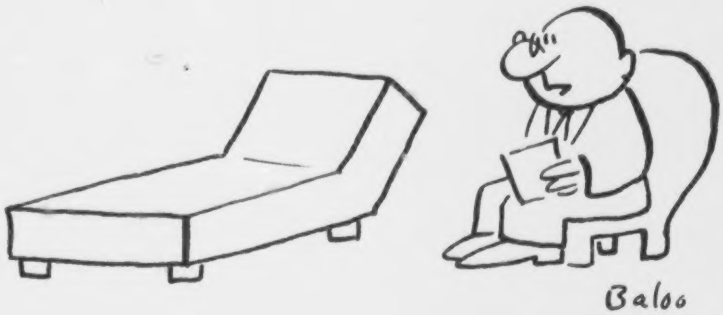
Vicarage Lane, Ilford
Essex IG1 4AQ, England

Although dropping down one place, telecommunications specialist Plessey continued to drum up steady dp sales in 1982. European dp revenues represented 16% of the company's worldwide total. Last year was also a good year overall for Plessey, with worldwide revenues up 14% to £963 million (in pounds sterling) also up 14%.

Plessey's peripherals division didn't fare as well. While revenues rose 3%, losses for the fiscal year ending in 1982 amounted to £1.7 million. These losses continued during the calendar year and are reportedly due to slackening demand in the U.S.

Plessey is staying with the outmoded 8-bit processors in its new microcomputer, which can host up to 16 terminals. This product moves Plessey into the oem marketplace, since this system will be sold through dealers, who will offer customized end-user software.

The British company is also finally moving into the office automation arena with its Integrated Business Information Systems (IBIS). This office system will be based around the new Integrated Digital Exchange (IDX) that handles voice, data, and text. During 1982 the first IBIS office terminal was released. The terminal provides word processing, records management, and multitasking capabilities.



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24

FERRANTI COMPUTER SYSTEMS LTD.

Western Road, Bracknell
Berkshire RG12 1RA, England

Last year was a comfortable year for this British company, which pulls in 85% of its dp revenues from its home market. While Ferranti achieved only modest (7.5% in pounds sterling) growth in dp sales, the company's overall profit picture was greatly improved.

Nevertheless, Ferranti fell five places in the Top 25 tally, ranking number 24 this year.

The firm, which specializes in computers for defense applications, also produces process control systems and semiconductors. Despite its strong military bent, Ferranti recorded a 40% increase in civilian system orders.

On the semi scene last year, Ferranti became involved in a Hong Kong venture to design and manufacture gate array semiconductor chips for the Far East market. The company, which is big in uncommitted logic arrays (ULA), currently has 30% of the worldwide gate array market.

In addition last year, Ferranti acquired the ailing Image Data Products, adding its graphic data input tablet to its peripherals line. The company also came out with two new terminals—the FT80, a rival to Digital's VT100 and the FT30, a graphics display model.

25

DATA GENERAL EUROPE

Tour Manhattan
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92095 Paris, France

Data General's profit slide that began in 1981 continued last year. Despite a 9% increase in

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worldwide revenues, profits slumped an astonishing 50%. DG's European dp turnover was also down 6%, dropping it into last place in the DATAMATION Top 25.

DG's hopes of following in the footsteps of big-time mini maker Digital seem to have been all but shattered. Suffering from sluggish sales, the company has been rumored to be a takeover target for the past two years.

Part of its woes can be blamed on its heavy oem approach. DG still derives 70% of its revenues from the oem sector—a sector that has experienced slackening sales due to the recession.

During 1982 DG took steps to reverse the downward trend. Opting to focus on a narrower range of products, the company drastically cut back its manufacturing capacity. At the end of last year it also made a major marketing shift when it decided to eliminate its in-house sales force and distributor network in favor of carefully screened systems houses.

The major product release in 1982 was the 32-bit MV4000 addition to the Eclipse minicomputer range. The entry-level computer, which is aimed at the industrial automation market, will also provide DG with a cheaper route into the office automation arena. The system will run all of the company's Comprehensive Electronic Office (CEO) products that are currently used on the larger MV6000 and MV8000 machines.

Despite the gloom and doom, Data General Europe is expected to survive the recession. Meanwhile, its parent DG in the U.S. is hoping to do more than just survive—it's hoping for a sales surge that will bring it back into the good ol' days.

DATAMATION

August 1983 Vol. 12 No. 4

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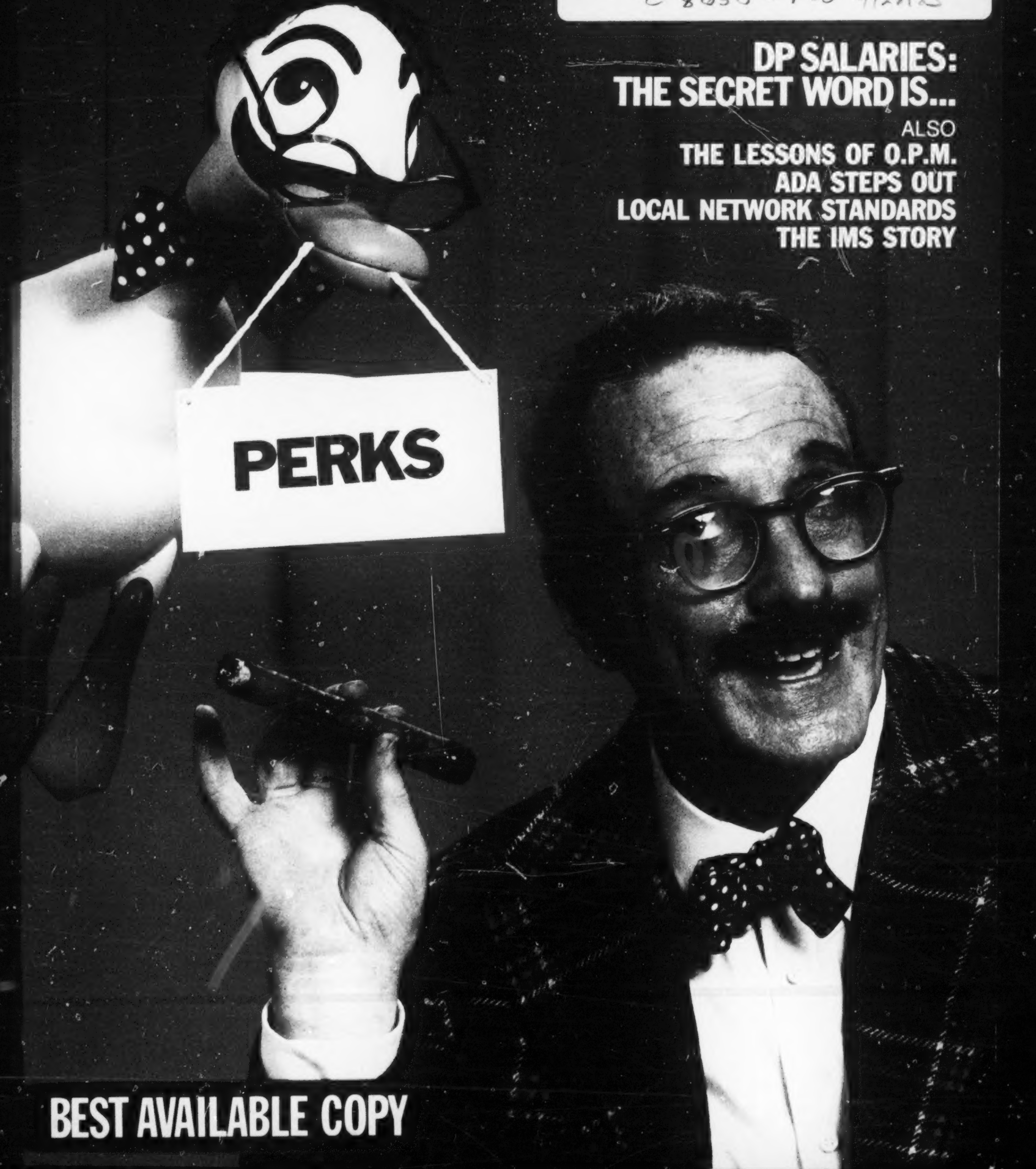

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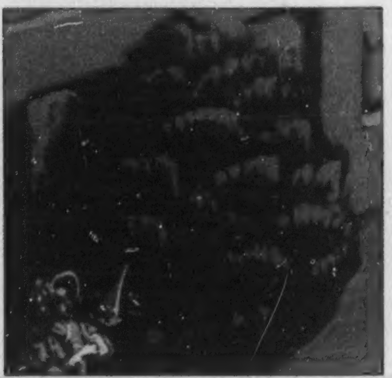

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COVER PHOTOGRAPH BY STEVE COOPER;
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The 10% or higher raise is fading from sight, but companies are becoming concerned with improving overall job satisfaction.

1983 DP SALARIES— THE KEY WORD IS PERKS

by Larry Marion

At first it seems hard to believe. The nation's economy is gaining strength by the second, the stock market is going like gangbusters, and your company is adding a second shift, but the boss just said that a big salary increase is out of the question. "It's not in the budget," he insists, while you shake your head in disbelief. Last year you felt lucky to get a 10% pay boost while the economy, and your company, were in the doldrums, but this year's 7% or 8% increase does seem anemic by comparison.

Don't feel too bad—less-than-robust salary increases are going to be the rule in 1983 for programmers, analysts, operators, and others in the data processing industry, according to the 1983 DATAMATION salary survey.

Last year there was a one in four chance that a data processing center would offer at least a 10% salary increase to its personnel, but this year the odds were about one out of six. Furthermore, more companies are handing out less than 5% raises in 1983, compared to last year (see Fig. 1).

As the salary gains slow, interest in perquisites soars. Life and health insurance benefits are standard operating procedure for more than 90% of the companies surveyed. In addition, the era of the two-income family has made the variety of other goodies important as those benefits are exempt from the 50% tax bite. For many dpers, then, "perks" is the magic word for 1983.

"Money is less important for those at the middle level," says Vincent Morgan, managing associate at the recruiting company Korn/Ferry International. "When you're al-

PHOTOGRAPHY BY STEVE COOPER SCULPTURE BY KATHY JEFFERS

Bureaucracy and red tape help create the paradox of a healthy economy with substandard raises.

METHODOLOGY

Early in June, 623 DATAMATION readers filled out a questionnaire on the salaries paid to the data processing department staff as of May 1, 1983. The respondents were selected on an nth name basis from the DATAMATION mailing list's subsection identifying the key person at each computer site. Most of the forms were completed by the dp manager and the remainder by the personnel department or a corporate executive.

About half of the computer sites were in suburban or rural areas of the country, representing the general transfer of back-office dp functions away from high-cost urban real estate. About a third of the respondents were manufacturing companies, 11% colleges and universities, 10% were government offices, and 6% were hospitals or other institutions. The average dp shop has 26 employees, up 8.6% from the May 1982 level, and about 80% of the dp centers in the DATAMATION survey had an annual budget of $1 million or less.

Of the urban sites polled, the New York City metropolitan area had the highest return, with 39 shops responding. The Chicago area was second, with 37 shops or 5.9% of the total, followed by Los Angeles with 31 shops, or 5%. Other urban areas represented in the survey are Boston, with 23 sites; Philadelphia, with 28 sites; the Washington, D.C. area, with 23 sites; and Dallas, Houston, Atlanta, Detroit, Minneapolis/St. Paul, Denver, St. Louis, and Seattle.

In addition to indicating the average salary raise over the past year, the respondents included the benefits, average salary, and experience levels for 56 different job classifications considered typical of data centers, from the vice president of dp at the top to the data entry tyro at the bottom.

ready making $70,000 a year, it's not a big deal when somebody offers you a few grand more." He reports that many job offers to middle management include some sort of equity participation, the proverbial piece of the action, that will be taxed at the 20% capital gains rate.

The DATAMATION survey found that about 20% of the companies polled have stock options, a third have profit-sharing plans, and about a quarter have some sort of investment plan, which usually involves matching employee contributions for stock purchases. These percentages have been growing over the past few years, Morgan reports.

A case in point is MCA Inc. of Los Angeles. "Five years ago, I got stock options, but nobody else in the department did," notes Al Jerumanis, vice president and director of corporate data processing for the entertainment company that includes Universal Studios, the movie company that produced *Jaws*. "Now the six managers reporting to me have stock options." In addition to stock options for senior and middle management, the company offers several stock purchase plans.

For those at the bottom of the totem pole and ineligible for the perks, there is some good news. The modest salary increase averages mask some important distinctions that help explain why paycheck gains are minimal compared to the recovery of corporate balance sheets. Companies in some industries pay relatively large merit increases, while companies in other industries are struggling to stay above water, and therefore retard the overall averages. The recession may be over from the point of view of the economists and academics in their ivory towers, but for certain industries around the country, not just in the Midwestern industrial heartland, plenty of problems remain.

Petroleum-based companies are suffering from a glut of oil, so dp salaries are not soaring in Houston. The showrooms of heavy equipment manufacturers are still empty, despite the return of buyers to automobile showrooms. Yet the salary increases for relatively healthy firms are also not keeping pace with the past, according to the DATAMATION poll, and the explanation is based on another economic fact of life: the impact of disinflation on corporate compensation plans.

"Not only are business conditions taken into account, but there is also an inflation component in compensation," explains Mark Hurwich, a compensation consultant at Towers, Perrin, Forster & Crosby. "When inflation cools down, compensation cools down." The U.S. Department of Labor a few weeks ago issued some numbers that shed light on the impact of a reduced inflation rate on raises. In 1981 the median pay increase for white collar workers was 9.8% and the inflation rate was 10.6%—therefore, real income dropped. In the 12 months ending in March 1983, the annual median pay increase was 7.1%, the department reported, but after taking the 3.6% inflation rate into account, real income was up 3.5%. It may be small consolation to the systems analyst looking at a 5% salary increase, but the fact is that the real worth of that measly raise is far greater than the 9% or 10% raise paid a couple of years ago.

RED TAPE PLAYS A PART

Bureaucracy and red tape also play a part in creating the paradox of a healthy economy with substandard pay increases. The rosy 1982 raises were determined by budget committees during innumerable meetings in mid-1981, when the economy was strong. Conversely, the 1983 salary increases were determined during the summer of 1982, which is going down in the record books as the lowest point for the nation's economic health since the Depression. "We prepare our budgets on a calendar year basis during the previous August and September," confirms J.C. Gracey, director of computer services for Tenneco Inc., Houston. "At that time [August 1982] we were looking for overall raises of two percentage points less than the range for 1982, basically due to economic conditions."

As a conglomerate, Tenneco represents both the good and the bad news on the economic landscape—its automotive divisions are doing well, but its large natural gas operations are not. In fact, the revenue and profit problems all over the Houston oil patch were so severe as to probably pull down the overall dp salary increases. More than half of the dp centers in Houston that responded to the survey said their salary increases would average less than 5% in 1983, compared to the typical 5% to 9% average last year. Furthermore, 37% of the Houston respondents indicated that 1982 raises averaged in excess of 10%, but for 1983 just one company indicated that a 10% or better raise was in the works. Notes a dp official at Gulf Oil Corp., Houston, "We had an average 9% raise in 1982, but only 6% in 1983, and I was surprised we'd have raises at all this year. The industry is in the pits."

The effect of the economy was more than to merely diminish the *size* of paychecks—the *number* of dp personnel getting paychecks also declined in certain areas. Houston employers polled by DATAMATION indicated that the number of people on their dp payrolls declined by 15.5%; in Minneapolis/St. Paul the decline was 20%. Detroit, of course, is down, but only 5%, due to the recent recovery of the auto industry.

Regional variations are not limited to the size and number of paychecks issued to data processing professionals. The life-style and attitudes of a community have an impact on salaries and benefits and on whether a job prospect will be hired at all. As a recruiter, Morgan of Korn/Ferry has heard many Northeastern companies order him not to offer jobs to people from the West Coast! The laid-back, hot-tub atmosphere is offensive to the normally intense Yankee from Boston. "They just don't like Californians," asserts Morgan. "They consider the work ethic there undesirable. They call it Silly Valley."

One of the West Coast perks that the

The real worth of a 7% salary boost is far greater than a 10% raise a couple of years ago.

New Englanders find most annoying, adds Morgan, is the company car. "In the U.S., the car is an emotional issue," he says. "Once you have a company car, you never want to pay for one again. Just about every candidate I had for one particular position has a car in his current compensation package, but the New England company just won't do it."

Nationwide, about three out of 10 companies responding to the survey offer automobiles to their employees. The range in percentages is illuminating, though—only 22% of the Chicago shops, 6% of the Minneapolis/St. Paul shops, and 39% of the New York shops offer cars, but in the Sun Belt, cars are available from 42% of the Los Angeles dp centers, 46% of the Houston centers, and 47% of the Dallas centers.

Dental care is another benefit with regional differences. Dental plans are available nationwide at about 61% of the data processing shops responding to the survey, but in only about half of the Sun Belt areas compared to three quarters of the East Coast shops.

CRISIS AT CHRYSLER

In Detroit, Paul Anders has had more basic things on his mind than dental plans or company cars. As manager of the information systems planning for the Chrysler Corp., three years ago he had to lay off 40% of the data processing department at the beleaguered automaker. And for several years thereafter, he couldn't pay the remaining troops an extra dime. "In 1980 and 1981, there were stringent cost reductions with no internal raises," says the weary Anders. To pick up the workload, outside service bureaus were hired for routine jobs such as data entry. Anders only offers hints of the problems he faced trying to keep dp people without offering them raises and allaying their fears that the company was on the verge of bankruptcy.

The only thing that eased his situation, according to other local dp managers, was the sorry condition of other companies in the area. "In southern Michigan, it's not too likely that you can go across town and find another job," says a neighboring dp manager, gloating over his 1% turnover rate over the past several years.

All that is behind Anders now. Over the past six months he has been able to offer salary increases of as high as 25% to the faithful employees who waited three years to see a larger number on their paycheck. He is hiring a few new analysts and programmers, and reports that prospective hires don't laugh anymore when they hear the name of the company.

"It's easier to hire now than it was two years ago, because of the company's sta-

JOB DESCRIPTION GUIDE

Respondents to the salary survey matched, as closely as possible, their staff categories to the job descriptions that follow:

1. *Vice President of MIS:* The senior executive for all corporate information systems. Responsible for long-range planning, budgeting, and operations.

2. *Director of Dp:* In charge of all dp at the divisional/departmental level. Responsibilities parallel those of corporate officers, but may be at least partially guided by decisions made at corporate level.

3. *Services Coordinator/User Liaison:* Interfaces between dp department end users; represents users when operational problems occur. (For the seniority levels in each of the next four categories, see the separate box on job levels.)

4–7. *Systems Analysis:* Confers with users to define and formulate logical statements of business problems and devise procedures for solutions through use of dp systems.

8–13. *Applications Programming:* Develops, designs, and prepares computer programs.

14–19. *Systems Analysis/Programming:* Performs the functions of both the systems analysis and applications programming positions.

20–22. *Operating Systems Programming:* Programs, maintains, and introduces modifications to systems software.

23. *Database Administrator:* Plans, organizes, and schedules the activities of the database section. Establishes standards, maintains dictionary, coordinates corporate database needs.

24. *Data or Telecommunications Analyst:* Specializes in network design, traffic analysis, and data communications software.

25. *Manager of Computer Operations:* In charge of computer operations, including scheduling, assignment of operators, and monitoring efficiency.

26. *Shift Supervisor*

27. *Lead Computer Operator:* May be responsible for the operation of large-scale computers for the duration of a shift or the operation of a remote site.

28. *Computer Operator:* Assists in running the computers and may operate console under general supervision.

29. *Production Control Supervisor:* Responsible for setting up and scheduling jobs for processing so as to maximize utilization and meet turnaround requirements.

30. *Production Control Clerk:* Prepares jobs for processing, enters the appropriate job commands, gathers output for routing.

31. *Data Entry Supervisor:* Responsible for a staff that performs data entry and verification functions.

32. *Data Entry Operator:* Qualified to operate one or more data entry devices; requires only general supervision.

33. *Word Processing Operator:* Qualified and experienced in the operation of intelligent typewriters, wp systems, terminals for text editing/wp.

SENIORITY LEVELS DEFINED:

Manager: Advanced degree and minimum five years' experience or equivalent. Strong management skills, works on own, performs personnel evaluation, budgeting, and project management.

Lead: Bachelor's degree or equivalent and minimum four years' experience in dp with two of those years in a supervisory capacity. Works on own and performs all levels of supervision, generally as a project manager.

Senior: Bachelor's degree or equivalent and minimum four years' experience including some supervision.

Intermediate: Bachelor's degree or equivalent and minimum two years' experience. Works on own most of the time requiring direction on some activities.

Junior: Two to four years college and minimum six months' experience or equivalent combination. Directly supervised but works on own on some aspects of job.

FIG. 1

ANNUAL SALARY INCREASES IN 1982 VS. ESTIMATED 1983 INCREASES

(BY PERCENT)

	TOTAL	BOS	N.Y.	PHL	WASH/ BALT	DEN	HOUST	DALL	CHI	ST. PAUL/ MINN	DET	S.F.	L.A.
1982													
Under 5%	21.7	13.0	7.7	25.0	17.4	30.8	9.1*	10.5*	32.4	0	66.7	21.4	12.9
5%-9%	52.3	43.5	48.7	53.6	39.1	38.5	54.5	52.6	48.6	62.5	16.7*	35.7	61.3
10%-14%	22.8	39.1	38.5	17.9	39.1	7.7*	36.4	36.8	16.2	31.3	16.7*	28.6	25.8
15% and over	2.2	0	2.6*	3.6*	4.3*	23.1	0	0	2.7*	6.3*	0	7.1*	0
1983													
Under 5%	24.6	13.0	7.7	21.4	34.8	46.2	54.5	5.3*	37.8	25.0	50.0	35.7	12.9
5%-9%	58.4	52.2	53.8	64.3	30.4	46.2	36.4	84.2	54.1	56.3	16.7*	50.0	67.7
10%-14%	13.6	34.8	35.9	10.7	26.1	7.7*	9.1*	5.3*	5.4	18.8	33.3	0	12.9
15% and over	1.8	0	2.6*	3.6*	4.3*	0	0	0	0	0	0	14.3*	0

*FEWER THAN THREE SITES REPORTING

FIG. 2

BENEFITS OFFERED

BY GEOGRAPHIC AREA

(BY PERCENT)

	GEOGRAPHIC AREA												
BENEFIT	TOTAL	BOS	N.Y.	PHL	D.C.	ATL	DEN	TEX	CHI	MINN	DET	S.F.	L.A.
Auto	30	39	39	32	26	36	23	47	22	6*	42	29	42
Club membership	16	13	23	25	13	18*	8*	30	16	19	17*	7*	3*
Recreational facilities	14	17	18	14	22	9*	15*	10*	19	13*	0	21	3*
Dental plan	61	57	74	71	57	55	77	47	51	63	67	93	87
Profit sharing	32	22	39	39	22	64	8*	40	32	31	8*	36	52
Investment plan	26	26	18	36	13	27	23	40	24	44	17*	21	32
Stock option	20	26	21	29	9*	27	15*	23	14	25	17*	36	32

BY TYPE OF ORGANIZATION (BY %)

	TYPE OF ORGANIZATION						
	MFG	FIN	INS	GOVT	EDUC	TRANS	UTIL
Auto	33	33	46	16	7*	36	73
Club membership	21	25	14	—	6	9*	18*
Recreational facilities	11	5	5*	8	41	18*	27
Dental plan	70	54	32	62	53	100	64
Profit sharing	48	38	32	—	—	27	9*
Investment plan	36	12	27	—	11	18*	55
Stock option	30	25	9*	—	—	18*	36

*FEWER THAN THREE INSTALLATIONS REPORTING
—NOT MEANINGFUL OR NOT AVAILABLE

"I had to offer unusual wages in the past," says the Chrysler man.

bility," he says. "In the past, I had to offer unusual wages." In essence, he had to pay more than the going rate to compensate new employees for the uncertain future of the company.

FIG. 3

AVERAGE ANNUAL DP SALARIES BY INSTALLATION SIZE

JOB TITLE	ALL	OVER $1 MIL	UNDER $1 MIL
Vice President of MIS or Dp	$50,469	$57,706	$47,410
Director of MIS or Dp	39,185	49,021	35,800
Services Coordinator or User Liaison	35,671	40,108	27,687
Systems Analysis Manager	35,247	39,962	32,373
Senior Systems Analysis	32,783	33,830	31,613
Lead Systems Analysis	29,837	31,699	27,871
Systems Analysis	27,556	28,884	26,265
Applications Programming Manager	33,551	37,644	30,075
Lead Applications Programmer	28,952	30,620	27,943
Senior Applications Programmer	26,427	28,335	25,116
Applications Programmer	21,288	23,400	20,358
Intermediate Applications Programmer	19,628	20,027	19,358
Junior Applications Programmer	16,789	18,531	16,071
Systems Analysis/Programming Manager	35,562	38,642	32,465
Lead Systems Analyst/Programmer	30,531	33,201	28,237
Senior Systems Analyst/Programmer	28,726	30,453	27,585
Systems Analyst/Programmer	24,302	25,505	23,375
Intermediate Sys. Analyst/Programmer	22,788	24,469	21,263
Junior Systems Analyst/Programmer	18,719	19,312	18,286
Operating Sys. Programming Manager	36,172	38,535	30,477
Senior Systems Programmer	32,156	32,876	29,775
Intermediate Systems Programmer	27,120	28,047	25,109
Database Administrator	29,379	31,455	23,715
Data or Telecommunications Analyst	26,666	27,541	24,150
Computer Operations Manager	27,495	31,550	24,270
Shift Supervisor	22,072	23,246	19,680
Lead Computer Operator	17,363	18,832	16,294
Computer Operator	14,848	16,254	14,164
Production and I/O Supervisor	22,149	23,206	20,836
Production and I/O Clerk	13,722	14,890	12,486
Data Entry Supervisor	17,318	19,334	15,842
Data Entry Operator	12,605	13,681	12,206
Word Processing Operator	14,959	14,829	14,939

Dp managers running computers in the financial industries have an embarrassment of riches—the fast recovery of the stock market last year and the reduction of interest rates are making life easy. Wall Street has dp job openings by the hundreds, and the deregulation of the banking industry offers untold opportunities for programmers, analysts, and applications writers familiar with securities and electronic funds transfer.

Financial organizations reporting to DATAMATION indicated a sharp jump in the average number of employees—29%—over the past year. Salary increases in financial districts from Wall Street to Mission Street generally ignored the inflation and recession lull, sticking to the same pattern over the past two years—about 90% of the financial companies that responded indicated the same 5% to 9%, or 10% to 14% ranges for salary raises in 1983, though 8.3% of the financial firms dropped their bonus levels to the less than 5% category in 1983—probably some banks burned by the oil glut.

Turmoil in the economy, the acquisition of his company by a far bigger one, and the departure of his corporate neighbors are some of the reasons George Ross is in a cheery mood these days. As executive vice president in charge of electronic data processing at Dean Witter Reynolds, the stock brokerage, he is spending less to keep the people he has, or to get the people he wants. Salary increases of 8% are the norm now, compared to 11% a few years ago. For newcomers he wants to hire away from other firms, 25% premiums were standard a few years ago but failed to find many takers. "We didn't get 60% of the people we offered jobs to," he says over an elegant lunch in the Wall Street financial district. "Now,' " he adds, "we get seven or eight out of the 10 people we go after with smaller premiums." It now takes one month to fill a vacancy instead of four.

Part of the reason dp talent searches at Dean Witter are of shorter duration is the impact of the recession on new openings and turnover. The head count at the average dp shop was up a rather modest 8.6% over the past 12 months, compared to the 13% to 15% growth of prerecession days. Hiring in the transportation sector of the economy was virtually nil, for example, but the uneven effects of the recession can be seen in the insurance industry—the average population actually doubled, to almost 41 persons per site from 20 last year.

With fewer new openings, turnover rates continued to be modest by past standards. About 85% of the companies reporting to DATAMATION said that turnover was less than 25%. Revolving-door hot spots are Dallas, with a third of the companies reporting 25% to 50% annual turnover rates, and other Sun Belt locations.

The weak economy might make it an employer's market, but other factors eased the recruiting burden. Many New York area data processing pros were loathe to work for a brokerage firm in the past because of the fickle nature of the stock market—today's boom could be tomorrow's bust. The combination of a rolling stock market and the recent acquisition of Dean Witter by Sears Roebuck and Co. changed the company's image, Ross declares. "It's easier to recruit people because the Sears backing makes us a bigger company, with more stability," he says. "Serious dp people are looking for stability, rather than growth, you know." The continuing trend of relocating employees from New York City to the Connecticut or New Jersey suburbs also makes life easier for Ross. "We've picked up some good people who didn't want to move with their companies." Given the large number of acquisitions and relocations over the past few years, Ross's experience may be more or less typical of what is going on around the country.

FIG. 4

AVERAGE SALARY BY INDUSTRY

(IN $)

JOB TITLE	ALL	MFG	FINANCE	INS	GOVT	MEDICAL
1. Vice President of MIS or Dp	50,469	54,368	50,220	41,456	52,100	60,750
2. Director of MIS or Dp	39,185	39,203	36,222	39,157	39,280	37,501
3. Services Coordinator or User Liaison	35,671	53,440*	33,000	23,000*	38,058	25,100
4. Systems Analysis Manager	35,247	38,966	30,833	33,000	33,833	29,167
5. Senior Systems Analysis	32,783	32,015	33,450*	28,302	31,517	29,500*
6. Lead Systems Analysis	29,837	30,591	27,000*	—	28,425	31,140*
7. System Analysis	27,556	27,835	25,000*	30,500*	29,254	26,500*
8. Applications Programming Manager	33,551	35,733	37,920*	25,250	37,212	35,000
9. Lead Applications Programmer	28,952	29,500	25,667	16,000*	29,880	27,019
10. Senior Applications Programmer	26,427	27,069	25,750	25,047	27,013	26,455
11. Applications Programmer	21,288	21,088	20,261	19,655	22,542	22,900
12. Intermediate Applications Programmer	19,628	20,259	18,060*	19,066	21,701	21,375
13. Junior Applications Programmer	16,789	17,353	16,240	16,024	16,708	17,245
14. Systems Analysis/Programming Manager	35,562	33,944	39,710	38,603	34,574	38,758
15. Lead Systems Analyst/Programmer	30,531	30,833	33,266	30,120	29,747	32,600
16. Senior Systems Analyst/Programmer	28,726	27,843	30,331	27,915	28,019	28,814
17. Systems Analyst/Programmer	24,302	24,338	24,170	25,020	23,193	23,167
18. Intermediate Systems Analyst/Programmer	22,788	22,090	23,494	23,976	22,025	23,840
19. Junior Systems Analyst Programmer	18,719	18,915	18,977	17,100	18,693	19,833
20. Operating Systems/Programming Manager	36,172	38,464	39,000*	39,180	36,957	30,000
21. Senior Systems Programmer	32,156	32,883	36,376	32,289	31,945	30,178
22. Intermediate Systems Programmer	27,120	27,519	30,500*	26,773	26,908	27,674
23. Database Administrator	29,379	30,917	30,000*	35,030*	32,117	22,000*
24. Data or Telecommunications Analyst	26,666	30,262	32,000*	28,244	25,930	—
25. Computer Operations Manager	27,495	26,808	28,940	30,956	29,245	26,288
26. Shift Supervisor	22,072	21,105	22,245	22,024	23,962	20,219
27. Lead Computer Operator	17,363	17,149	17,489	17,331	18,108	20,378
28. Computer Operator	14,848	15,186	13,659	14,581	16,322	14,476
29. Production and I/O Supervisor	22,149	24,706	19,486	23,657	22,686	22,179
30. Production and I/O Clerk	13,722	13,546	11,298	12,757	14,621	14,144
31. Data Entry Supervisor	17,318	17,696	19,597	17,194	17,121	15,828
32. Data Entry Operator	12,605	12,573	12,324	12,038	12,899	12,832
33. Word Processing Operator	14,959	15,756	14,500*	12,389	13,600	15,000

*FEWER THAN THREE SITES REPORTED

—NO RESPONDENTS IN THIS CATEGORY

HIRING IDEAS AT CITIBANK

George Ross's gains are Gloria Krimper-Mendez's losses. She's in charge of recruiting data processing personnel for Citibank N.A., the massive bank that has its dp operations spread from New York to California to South Dakota. Citibank recently offered stock brokerage services to its customers, so Krimper-Mendez is trying to hire applications programmers and systems analysts from the securities industry. The high salaries paid for the riskier environment of Wall Street are unknown in the safe world of banking, and she must look harder to come up with new ways of compensating personnel without giving away the vault. "People with brokerage background are used to a 50% bonus at the end of a good year, but we can't do that," she says. Among her ideas: offer annual pay raises in one lump sum rather than spread throughout the year.

Krimper-Mendez is thinking about novel compensation schemes as part of an overall trend toward enhancing job satisfaction. "In the past six years I've been in the business, I've seen tremendous change in what is important for dp people to change jobs," says Krimper-Mendez. "Money is not the main motivation." She cites the innovator reputation of Citibank as one of the prime attractions: "Our reputation is that if there's something new in the industry, Citibank has it." She's not just blowing smoke—Citibank was one of the first banks to design, build, and install an elaborate electronic funds transfer network, including widespread use of automated teller machines.

Intangibles such as "doing an interesting project," "taking a program from in-

An MBA and the ability to converse with businessmen is worth a 10% salary premium.

TRANS	EDUC	UTIL
52,167	42,625	80,000*
39,400	35,061	35,950
—	51,700*	—
32,500*	28,915	38,333
30,000*	32,287	32,667
—	25,000	—
—	22,243	28,800
33,667	29,282	35,000*
19,000*	22,500*	37,500*
21,710*	21,816	32,500*
21,167	17,427	25,000*
14,500*	15,841	17,000*
15,500*	12,913	20,000*
34,633	33,962	38,500*
35,000*	26,547	—
—	26,035	19,000*
26,800	21,450	28,000*
27,266*	18,183	39,000*
—	17,048	32,000*
36,550	28,750	42,000*
28,000*	26,083	42,000*
27,000*	22,000	35,000*
32,800*	32,000*	28,000*
16,500*	19,667	27,000*
28,850	23,472	30,800
21,000*	24,250	24,500*
13,400	15,659	19,605
12,714	14,019	15,933
—	19,226	26,000*
21,575	13,857	—
22,675	16,887	—
13,944	11,931	16,267
13,000*	—	18,500*

ception to debugging," and "improving the quality of work life" are a major new type of demand from data processing professionals. "I hear this job satisfaction issue more and more," says Gracey of Tenneco. "Many people here are now turning up their noses when we ask them to do some program conversion work. They don't find it interesting." Another job satisfaction issue is visibility. George Ross of Dean Witter notes that many of his dp people are attracted to the prospect of coming out from behind the code-writing tables and actually interacting with other parts of the company. "They're not isolated in the dp department anymore," he says.

For certain people, certain jobs, and certain employers, large piles of dollars are the first consideration, before they talk about the company gym. Recruiters and dp managers have a "prime picks" list, the ideal combination of skills, personality, and experience where the right job applicant can practically write his own ticket. The route to the blank check consists of an intimate knowledge of how businesses work and how businessmen think, an ability to communicate in the language of the user, not the language of a machine, and experience with the key technological issues of the day, such as telecommunications and database management.

The crucial characteristic for big salary increases or a better job is verbal communications skill. "I can't stress enough that the goal of most of my searches is to find people who can speak the language of the user," says Morgan of Korn/Ferry. The prospects are glowing for the manager of applications programming who can comfortably discuss financial benchmarks such as return on assets, market share, and product line margins and then prepare the software to deliver that information in the manner requested by the product manager. "The salary for someone with those qualifications is a $70,000 base with a bonus of $5,000 to $25,000," Morgan states. Then he pulls out a list with a dozen such openings he has at the moment. Many of the new hires he finds will replace current managers who were demoted. "Companies realize that their incumbent cannot talk to users and needs to be replaced," Morgan notes, explaining that the rise of personal computers and distributed data processing systems is moving the computer terminal and the technology closer to end users who demand results, not excuses.

THE PRIME JOB CANDIDATE

The most likely candidate for the golden paycheck is someone who spent a decade working on database management with an undergraduate degree in computer sciences and a graduate degree in business administration. That combination of skills is worth a 10% premium over another candidate without the MBA and unable to converse in English, notes Krimper-Mendez of Citicorp. "Before, we were never asked to find someone with a degree, just someone with experience in COBOL and CICS," she says. "Now they want to see an advanced degree in business along with a bachelor's in computer science." For such a person, a salary of up to $60,000 is available, she says.

Another prime job candidate is someone with telecommunications skills. The ability to design networks for transmitting megabytes of data across state and national boundaries is the most sought-after of skills by many dp managers right now. "Good telecom people are hard to find, and command premium prices," notes Al Jerumanis at MCA Inc. He has first-hand experience with the telecom marketplace—he just hired four telecom specialists as part of a corporate-wide review and revamp of voice and data communications systems.

Gulf Oil is about to venture along the telecom salary path, and an official there says he knows it will be rough. A pilot project now under way will lead to a new network configured with "an order of magnitude" increase in the number of points served and a sharp increase in the amount of data transmitted at a time. The new scheme will require the Gulf telecom staff to triple, an official says.

Nationwide, the DATAMATION survey indicates that the average pay for telecom managers is $36,370, but the scarcity of job candidates is reflected by the wide range of salaries—from $30,000 in Dallas to $53,000 in Denver. Manufacturing and finance companeis were more likely to pay the big bucks, while utilities were the lowest-paying industry category; given the fact that most utility operations are within one state, the telecom nets are not as complex.

The cost of telecom experts was more than Anders of Chrysler could pay—he gave up trying to find someone with the experience and willing to work for the salary he could offer. "We think the salaries we offer are fair," he says, "but we can't touch experienced telecom or office automation people." He hires less experienced data processing staffers and then tries to upgrade their skills.

With all those data flowing around the country, it follows that database administrators are also attracting higher salaries. The expanding number of microcomputer users means an ever-expanding number of demands for access to corporate databases. "The problem is dramatic," says the Gulf official. The average salary for directors of database administration was $33,164, but here again there is a wide range of respondents to the survey—$19,500 in New York, of all places, to $45,000 in Los Angeles. The gap between big shop and small shop is graphically illustrated by the 28% difference in salaries, $37,979 versus $27,447, in shops with larger than $1 million annual budgets compared to the smaller ones.

All the new buzzwords—office automation, telecommunications, and database management—are now part of the responsibility of the vice president of management information services or data processing, the head honcho in data processing. "In addition to the traditional dp tasks, he's much more likely to be given new ones he'd better know

FIG. 5

AVERAGE SALARY BY MAJOR CITIES

(IN $)

JOB TITLE	ALL	BOST	NEW YORK	PHIL.	WASH/ BALT	ATL
		GEOGRAPHIC AREA				
1. Vice President of MIS or Dp	50,469	46,667	64,344	52,250	42,667	58,500
2. Director of MIS or Dp	39,185	40,018	47,037	38,880	42,470	43,667
3. Services Coordinator or User Liaison	35,671	19,000*	33,250	50,000*	42,000*	—
4. Systems Analysis Manager	35,247	34,312	43,500	33,000*	33,437	38,000
5. Senior Systems Analysis	32,783	29,000*	37,500	32,607	37,600	36,000*
6. Lead Systems Analysis	29,837	40,000*	33,280*	29,000*	31,500*	—
7. Systems Analysis	27,556	—	28,400	28,000*	27,667	26,667
8. Applications Programming Manager	33,551	40,086	33,500*	35,333	36,000	31,000*
9. Lead Applications Programmer	28,952	27,875	33,000*	35,000*	30,667	28,500*
10. Senior Applications Programmer	26,427	28,200	29,857	26,000	26,600	24,055
11. Applications Programmer	21,288	20,571	20,757	21,606	21,187	19,667
12. Intermediate Applications Programmer	19,628	24,000*	23,624	20,500*	25,000*	25,000*
13. Junior Applications Programmer	16,789	18,667	17,460	13,350*	16,624	18,700*
14. Systems Analysis/Programming Manager	35,562	42,000	39,600	35,998	32,000	35,500*
15. Lead Systems Analyst/Programmer	30,531	27,000	34,500	34,333	27,600	26,500*
16. Senior Systems Analyst/Programmer	28,726	—	33,944	30,854	25,727	29,000*
17. Systems Analyst/Programmer	24,302	24,500*	26,036	25,030	20,467	24,000*
18. Intermediate Systems Analyst/Programmer	22,788	19,000*	22,187	23,433	17,933	—
19. Junior Systems Analyst/Programmer	18,719	17,000*	20,000	20,125	19,478	17,000*
20. Operating Systems/Programming Manager	36,172	39,333	19,000*	42,250	33,500	40,000*
21. Senior Systems Programmer	32,156	30,333	36,000*	40,333	35,000	28,000
22. Intermediate Systems Programmer	27,120	25,000*	29,000*	26,380	29,000*	—
23. Database Administrator	29,379	—	15,000*	—	38,000*	—
24. Data or Telecommunications Analyst	26,666	28,000*	25,000*	22,000*	—	16,500*
25. Computer Operations Manager	27,495	22,125	29,036	27,894	31,581	26,140
26. Shift Supervisor	22,072	—	19,750	18,875	32,000*	17,000*
27. Lead Computer Operator	17,363	16,967	18,635	16,107	18,174	16,033
28. Computer Operator	14,848	14,234	14,486	16,159	13,698	12,125
29. Production and I/O Supervisor	22,149	23,750	18,720*	25,000*	25,000	—
30. Production and I/O Clerk	13,722	11,500*	12,349	14,378	12,600	11,000
31. Data Entry Supervisor	17,318	19,333	18,735	18,650	15,270	13,500*
32. Data Entry Operator	12,605	12,300	13,324	12,470	12,523	11,929
33. Word Processing Operator	14,959	12,000*	16,125	15,250*	—	—

*FEWER THAN THREE SITES REPORTED

—NO RESPONDENTS IN THIS CATEGORY

about,'' says Vince Morgan of Korn/Ferry. Materials resource planning is a hot item these days, he says, along with the nuts and bolts in telecommunications.

"Companies are concerned with the coherent growth of personal computers, too,'' he adds, "and they don't yet have control, so we see requests for new people to come in and organize an internal system that would stop the micro proliferation by introducing something better.''

SKILLS OF A DP VICE PRESIDENT

All of these skills are required of the top man these days. Of the 623 data centers responding to the survey, 109 had a vice president for dp and are paying an average of $50,469 a year in base salary. Of course, vice presidents in New York City earn more than a vice president in Detroit—$64,344 versus $38,000. Size of shop is one of the reasons—the average $1 million-plus budget has a vp salary of $57,706, while the smaller shop's vp receives only $47,410. The highest average salary was in the utility industry, with an annual base compensation of $80,000. The average vice president for dp has about 14 years of experience and is likely to live in Dallas, St. Louis, or somewhere in the Minneapolis area. His employer is probably a bank, brokerage, or utility, where each has an average salary of more than $60,000.

Most of the companies polled do not

A New York CICS consultant charges $1,000 a day.

DEN	HOUS	DAL	CHI	ST PAUL/ MINN	DET	S.F.	L.A.
—	57,000	50,714	56,083	52,000*	38,000*	4[illegible],500	51,943
46,612	48,971*	44,756	43,055	39,357	40,064	41,083	41,773
38,916*	48,000	23,000*	—	35,000*	—	36,000*	41,970
58,000*	35,467	37,833	40,590	34,715	—	36,000*	36,400*
42,000*	34,260	34,800*	34,744	34,500	44,150*	36,500*	38,245
33,000*	33,000*	31,300*	32,829	30,100*	30,000*	—	—
26,500*	—	28,500*	29,922	30,200	26,550*	—	26,667
39,000	—	37,500*	38,690	30,167	—	36,500*	36,657
50,000*	31,500*	32,000*	32,275	30,000*	25,900*	35,000*	28,200*
36,000*	32,507	26,367	28,463	18,500*	25,833	33,000*	32,900*
27,600	24,400	23,726	21,972	17,550	18,003	26,333	21,031
18,000	20,000*	20,125	18,457	13,000*	—	—	26,000*
13,500*	17,500*	16,667	17,259	15,000*	17,000*	20,375*	20,000*
42,100	38,533	40,778	34,440	43,500*	35,088	40,600*	41,165
34,133	41,000*	38,750*	31,812	31,000*	30,900	34,000*	35,470
31,500	28,208	29,625	30,733	28,000*	27,150*	30,625	31,081
26,500	25,162	27,100	22,271	26,000*	20,667	28,325	27,908
27,000*	23,250*	19,700*	22,000*	25,000*	22,487	28,100*	25,259
23,750*	19,833	17,667	12,900*	18,000*	14,413*	23,100*	19,094
53,000*	42,467	41,375	32,200	34,000*	36,267	39,000*	46,600*
33,433	40,430*	35,500	34,000	—	26,500*	36,500	38,976
28,850*	32,280*	32,500*	29,000*	26,000	21,700*	27,500*	34,696
40,000*	44,500*	26,500*	24,833	29,000*	32,650*	—	22,500*
38,000*	—	27,000*	32,000*	—	—	—	28,000*
32,629	31,540	29,500	32,581	22,950	28,420	30,000*	29,206
25,325	19,500	23,000	24,500	18,000*	26,250*	33,500*	23,822
24,267	19,200	18,172	17,413	16,600	16,756	16,500*	20,878
17,544	15,978	16,051	15,400	13,977	14,581	17,900	16,325
26,700	24,100*	20,425	21,300	20,000*	26,550*	—	25,988
16,700	16,444	11,500	13,729	—	14,839*	19,000*	14,259
21,500	18,907	16,114	17,883	14,100*	18,687	18,000*	16,281
14,100	13,165	12,992	13,120	11,714	13,914	14,408	13,725
12,700*	—	16,000	18,500*	18,200*	—	—	15,000

have a vice president of data processing, but instead a manager of data processing. He or she earns about $39,185, or about $25,000 less than the vice president, even though the average dp manager has more experience—an average of 14.95 years versus 14.34 years.

Houston dp managers have the highest average salaries, according to the survey, at $48,971. Transportation firms are likely to pay higher salaries to dp managers than colleges, but the range is relatively narrow—less than $4,000 separates the highest-paying industry average from the lowest.

The managers of systems analysis average $35,247 per year, and their subordinates receive salaries that range from the $34,744 average for Chicago-area senior systems analysts to the $21,000 for junior analysts around the country. In big shops, the average salary for the manager of systems analysis is $39,962; in small sites, $32,373. Operating systems analysts probably command a premium compared to their applications analysis colleagues. Gracey of Tenneco reports that a recent campaign to add operating systems analysts to his staff failed to find any takers, though several applications analysts applied. "When you run an ad and nobody qualified replies, you know you have to give a 25% premium to find good people," he says.

Less glamorous jobs unfortunately pay less well. The unappreciated computer center operator, the manager who is the first to be blamed for a systems crash but the last to be thanked when things go right, has an average salary of $27,495; the highest-paying location for operating managers is Denver, with an average salary of $32,629. The insurance companies that responded to the survey apparently have the highest rates, $30,956 per year. For big budget sites, the manager receives $31,550, for small sites the paycheck is $24,270.

As for the lead computer operator, the average salary is $17,363, but the range varies from a modest $16,000 in Atlanta to the comparatively robust $24,267 in Denver. Health care organizations have the highest average salary for lead computer operators, $20,378.

The more modest salary increases of the past few years have not necessarily limited the income options of some programmers and analysts. Krimper-Mendez of Citicorp reports that CICS consultants get $800 to $1,000 per day in New York City. Nationwide, a survey by J. Dick & Co., a publisher of computer software consultants, found a rising number of consultants and sharply higher fees. "The billing rates of computer software consultants shows that the profession has come of age," says John Dick. Of the 800 consultants in his survey, the billing rates for those with mainframe expertise reach $150 per hour.

So if the current level of salaries and benefits are not to your liking, there is an alternative—hang out a shingle and become a consultant. For $1,000 a day, it's nice work if you can get it. ◆

The 1983 DATAMATION salary survey is now for sale in report form. It contains more than 160 pages of charts showing the average salary for more than 50 data processing positions in 15 major cities as well as an overall national average. Single copies are $50 and customized analysis services are also available. For more information contact Laurie Schnepf, Research Director, DATAMATION, 875 Third Ave., New York, NY 10022.

Analyst, programmer, and operator positions should increase significantly during the decade.

THE DP POPULATION BOOM

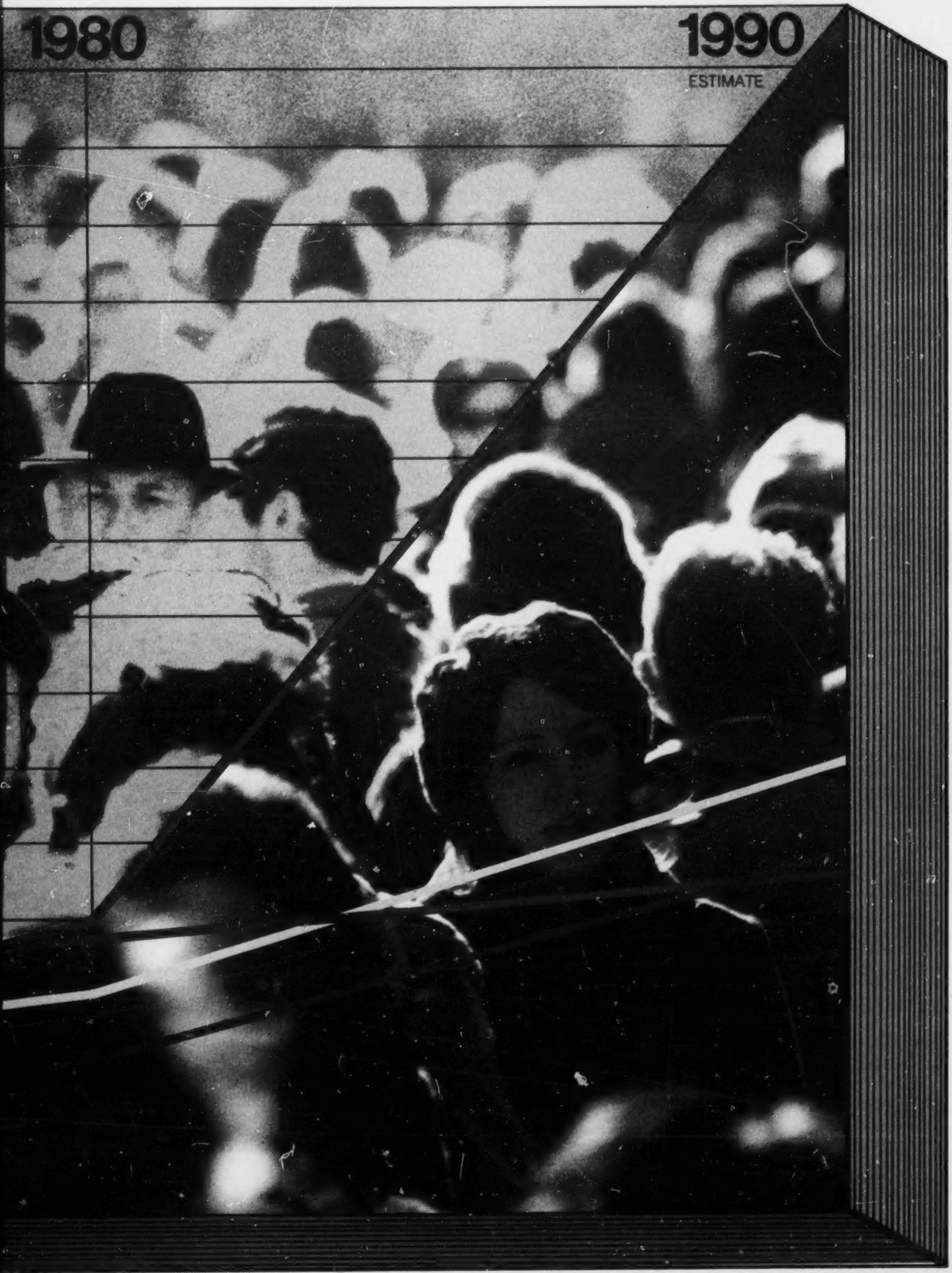
by Bruce Gilchrist, Ates Dagli, and Arlaana Shenkin.

Employment opportunities in the largest data processing fields will continue to be very good throughout the 1980s. In total, the number of new positions in systems analysis, programming, computer operations, and key entry operators should increase 54%, or 1.7 million, for a total population of 3.1 million by the end of the 1980s. This compares with slightly over 700,000 added in the '70s. This optimistic forecast is based on recently available data from the 1980 census and a review of the factors that are likely to affect employment in each of the four occupations.

The largest increases will be seen in the computer operator category, expected to experience a 13.6% annual growth rate for the decade or about 1 million new positions. The reason for the sharp jump is the increase in the number of small business computers and other desktop units now used by computer operators who were, in many cases, clerks in the past. Systems analyst positions are expected to increase by 9.7% per year to more than 511,000, and the programmer population may increase at a 7% annual rate, reaching a total in excess of 317,000 by the end of the decade. The compound annual growth rate of keypunch operators will slow to about half of the 3.9% rate recorded during the 1970s, but the data entry population will rise to about 477,000.

These estimates are based on an analysis and comparison of the 1970 and 1980 data published by the Bureau of the Census of

CHART BY C. STODDARD AND PHOTO BY L. FRIED/IMAGE BANK


1980
1990
ESTIMATE

The large inventory of COBOL programs will need to be maintained for a considerable number of years.

FIG. 1

NUMBER OF FEMALE, BLACK, AND HISPANIC DP EMPLOYEES, 1970 AND 1980

(BY PERCENT)

	FEMALE		BLACK		HISPANIC	
	1970	1980	1970	1980	1970	1980
Systems Analysts	15	23	3	5	1.9	2.4
Programmers	23	31	4	6	2.2	2.8
Computer Operators	29	59	8	12	4.1	5.2
Key Entry Operators	90	92	12	17	4.1	6.3

the U.S. Commerce Department. Fundamental to any forecast of the next 10 years is a review of the factors behind the larger-than-expected increases in data processing jobs during the past decade.

For some years the U.S. Department of Labor has been predicting that the number of key entry operators is about to decline. The census data for 1980 suggest that the announcement is at least premature. True, there have been considerable advances over the recent years in source data recorders, optical character readers, and system to system data communications, but two offsetting factors have kept the data entry payrolls growing.

The first is that the volume of data required by the rapidly growing number of computers and computer-based applications has been increasing. The second is that, although moving the data entry function to the user area may have decreased the number of data entry operators employed directly by data processing centers, it has resulted in some user area personnel regarding themselves, probably correctly, as data entry operators rather than, say, clerical assistants or order entry clerks. Therefore, further growth, albeit somewhat modest, is projected in the number of people functioning as key entry operators.

There are many reasons why the population of systems analysts will continue to increase at a high rate. Despite the development of personal computers, distributed processing, information centers, and structured analysis tools, the fundamental need remains for situations to be analyzed and procedures developed for their solution. The applications backlog at large installations and the continued rapid expansion of the use of inexpensive computers in smaller organizations, or in subunits of bigger ones, suggest that there will be no slackening in the demand for systems analysis skills. Some of this work will undobutedly be done by people not classified as systems analysts. Enough will be done, however, by people who regard themselves as full-time systems analysts to keep employment in this classification growing.

FACTORS AFFECTING JOBS

As for programmers, the last few years have seen very significant growth in two areas that can adversely affect the employment outlook. One is in programming packages and the other is in programming tools. Although both developments require a considerable number of expert programmers, this employment should be more than offset by the increased productivity of applications programmers who use the packages and tools.

At the same time as the productivity of programmers is increasing, however, the number of applications and the number of computers continues to grow rapidly. One published estimate indicates that the number of computers in use in the U.S. will grow from 2 million in 1981 to 16 million in 1986. This growth is primarily in the micro area, but significant growth is expected in minis and some also in large computers. The increase in computer power is even greater than these numbers would suggest since the computational power per machine is also growing rapidly. Also, don't forget the very large inventory of COBOL programs that will need to be maintained for a considerable number of years using existing techniques.

The net effect may well be that the combination of inertia and the need of many small computer installations for at least one person who devotes close to full time to programming will result in continued growth in the number of full-time programmers. Since the developing productivity tools will likely have a greater impact on programming positions than on systems anaylysts jobs, it is expected that the employment of programmers will continue to increase at a slower rate than will the employment of systems analysts.

The computer operator population growth will occur despite several negative factors. The larger installations are benefiting from improved operating systems, peripherals that requires less operator attention, and a move of input/output to user areas—the net result of which will probably be relatively little growth in the number of operators at such installations. The very rapid growth in the number of small installations, many of which will require at least one operator, however, should result in continued rapid increase in the number of professional operators.

In the case of micro systems in small companies or the branch offices of large companies, the operators may be regarded as clerical employees by management but will report themselves—probably correctly—as computer operators to the census. The dramatic increase in the number of women reporting themselves as computer operators suggests that this is in fact happening. To keep 1970 and 1980 data comparable, the 1980 data for peripheral equipment operators have been combined with that for computer operators.

Turning these qualitative comments on employment into precise quantitative projections is at best a risky operation. To do so for the dp occupations is doubly so in light of the countervailing trends. Nevertheless, on the basis of current industry trends, it is highly likely that the growth rates of the '70s will continue through the '80s except in the case of data entry operators, where it will probably drop to half the previous level. This leads to the estimate that the 1990 employment in the four occupations will be over 3.1 million.

For systems analysts and programmers, these projections are approximately 25% higher than those published by the U.S. Department of Labor in late 1981; recently Labor Department data on employment in 1982 strongly support the higher numbers suggested here. In the two operator categories the projections are almost double those of the Labor Deparment continuing its conservative approach. The DOL also uses the employer viewpoint of what a job should be called, whereas this projection assumes the census or employee view of job definitions.

SUPPORT JOBS WILL INCREASE

Although the relevant data are not collected, it can also be assumed that employment in areas such as management, administration, clerical, maintenance, and in other supporting roles directly associated with data processing has and will continue to increase at rates comparable to those of the explicitly defined and counted dp occupations.

The census data reflect what individuals reported as their occupation during one particular week in April of each census year. Persons employed in more than one job are

Government forecasts were unduly cautious. Instead of the 3.6% growth rate for programmers in the 1970s, it turned out to be 7%.

FIG. 2

TEN LARGEST DP STATES

DP POPULATION BY JOB TITLE

	ANALYSTS			PROGRAMMERS			OPERATORS			KEY ENTRY			TOTAL		TOTAL GROWTH
STATE	**1970**	**1980**	**% Δ**	**1970**	**1980**	**% Δ**	**1970**	**1980**	**% Δ**	**1970**	**1980**	**% Δ**	**1970**	**1980**	**(BY %)**
Calif.	10,465	29,907	186	22,187	43,294	95	14,136	50,679	259	26,930	47,159	75	73,718	171,039	132
N.Y.	9,077	19,858	119	21,596	30,696	42	14,675	35,656	143	31,494	36,993	17	76,842	123,203	60
Texas	4,044	11,134	175	8,376	21,237	154	6,672	29,444	341	14,128	25,883	83	33,220	87,698	164
Penn.	4,593	9,585	109	8,902	15,887	78	6,164	19,781	221	17,568	20,893	19	37,227	66,146	78
N.J.	4,312	10,139	135	8,569	15,409	80	5,556	17,114	208	12,694	17,386	37	31,131	60,048	93
Ohio	4,253	8,080	90	7,672	13,130	71	6,133	18,521	202	14,940	19,650	32	32,998	59,381	80
Mich.	2,926	7,584	159	5,946	10,164	71	4,755	15,250	221	11,473	13,955	22	25,100	46,953	87
Mass.	3,061	8,719	185	6,886	12,485	81	4,183	12,886	208	10,799	12,617	17	24,929	46,707	87
Fla.	1,669	5,511	230	3,721	9,101	145	3,145	15,225	384	6,202	12,146	96	14,737	41,983	185
Md.	4,708	9,574	103	6,816	11,460	68	4,040	11,304	180	6,506	9,461	45	22,070	41,799	89

FIG. 3

TEN FASTEST GROWING DP POPULATIONS BY STATE

JOB TITLE

	ANALYSTS			PROGRAMMERS			OPERATORS			KEY ENTRY			TOTAL GROWTH
STATE	**1970**	**1980**	**% Δ**	**1970**	**1980**	**% Δ**	**1970**	**1980**	**% Δ**	**1970**	**1980**	**% Δ**	**(BY %)**
N.H.	162	1,362	741	537	1,949	263	283	1,658	486	859	1,644	91	259
Idaho	72	290	303	247	739	199	185	1,364	637	405	816	101	253
N.Dak.	26	143	450	157	424	170	49	636	1,198	242	432	79	245
Ariz.	763	2,605	241	1,357	3,754	117	827	4,855	487	1,790	4,606	157	234
Nev.	88	411	367	283	734	159	260	1,225	371	363	928	156	232
S.Dak.	22	98	345	71	399	462	119	724	508	315	500	59	227
Wyo.	39	74	90	77	231	200	91	526	478	154	344	123	225
Alaska	54	201	272	153	287	88	80	669	736	201	422	110	224
Colo.	1,085	3,712	242	2,256	6,755	199	1,491	6,870	361	2,886	5,747	99	199
Maine	102	421	313	165	715	334	244	1,269	420	721	1,164	61	190

counted only once in the census—according to the job at which they work the greatest number of hours during the reference week. After the individual completes the census form, a trained census coder slots the response into one of 503 census occupational classifications. Therefore, the possibility exists for individuals to describe their jobs incorrectly and/or the coder to assign the classification numbers erroneously. More important, individuals may view and report their jobs differently than might their employers. Thus, for example, some junior accountants assigned to spend most of their time developing financial reports using a report generator (RPG) program might describe themselves to the census as programmers. Similarly, the one programmer at a small installation might describe himself or herself as the "manager of programming" and be classified by the census coder as a manager rather than as a programmer.

The job self-classification problem inherent in the census is not too serious when comparing one census with another because, presumably, individuals will have about the same biases each time. As pointed out in the earlier discussion of the operator projections, however, the problem becomes much more serious when census data are compared with data from other sources that do not use self-classification. Unfortunately, the census is only taken every 10 years, so that in the interim periods, other sources of information must be relied upon. This can give rise to fluctuating estimates as can be seen from a brief examination of the history of estimates of the number of programmers.

In 1966, the American Federation of Information Processing Societies (AFIPS) published an overview of the information processing industry that included several estimates of programmer employment in 1970. These varied between 200,000 and 650,000. In 1971, Walter Carlson, president of the Association for Computing Machinery (ACM), testifying at a Labor Department hearing, said that consensus data would appear to support there being approximately 250,000 programmers in 1970, with an expected increase to 500,000 by 1975. One of the more conservative estimates made before the publication of the 1970 census data was by the Labor Department in its very widely distributed *Oc-*

It is very hard to predict a change in growth rate, let alone its precise timing.

cupational Outlook Handbook. The 1972-'73 edition stated that nearly 200,000 programmers were employed in 1970. When the 1970 census data were finally released, it was seen that 161,377 programmers were actually "counted" in April 1970.

After the 1970 census had demonstrated that both government and private forecasters has been overestimating the number of programmers, the government forecasts became much more conservative. Some might say they became unduly cautious. For example, although a nongovernmental analysis of the 1970 census and comparable data from the Labor Department's Area Wage Surveys had shown that the annual growth rate for programmers was over 6% in 1970, the Labor Department in 1974 used an annual growth rate of only 4.6% in projecting that there would be 250,000 programmers by 1980. Two years later, in 1976, the Labor Department was even more conservative and estimated that the 1974 programmer employment was 200,000 and that it would grow to 285,000 by 1985—an average annual compound growth rate of only 3.3%. As late as 1982, the *Occupational Outlook Handbook* stated that "in 1980, about 228,000 persons worked as computer programmers." This last figure implied a mere 3.6% average annual compound growth rate from 1970.

GROWTH RATE CONTINUES

As stated earlier, the 1980 census showed that, in fact, there were 317,673 programmers in April 1980. This is equivalent to a 7% annual compound growth rate over the 10 years from 1970. In other words, the slowing down in the growth rate that the Labor Department had consistently assumed throughout the decade simply had not occurred.

A similar story can be told of widely varying projections of employment in the other dp occupations. To give just one example: Carlson, in his previously mentioned 1971 testimony, also reported that census data at that time supported the estimate of approximately 500,000 computer operators in 1970 and 900,000 in 1975. In fact, the 1970 census reported 117,222 operators and by 1980 there were still only 420,581. The growth to 900,000 will certainly come, but some 10 years later than Carlson suggested.

DOG & COKE
BURGER BARN
FRIED FISH
PIZZA
CAKES & ALE
DAFFY DONUTS
EARL of SANDWICH
CHICKEN IN A BASKET
ENTERING
FAST FOODS
INCORPORATED 1965
AVERAGE STOP
22.561 MINUTES

CARTOON BY HENRY MARTIN

The main lesson from history is to treat all dp employment estimates with caution, especially those that incorporate a change from an observed growth rate. It is simply very hard to predict a change in growth rate, let alone its precise timing.

So far, census data have been quoted down to the single individual. To the unwary, this might seem to imply that everyone is asked his occupation and that, leaving aside definitional questions and the problem of general undercounting, an absolutely precise count is obtained. Such is not the case.

In both the 1970 and 1980 censuses, the employment data came from samples. In 1980, the sample was chosen as follows: in counties, incorporated places, and minor civil divisions estimated to have fewer than 2,500 persons, one half of all housing units and persons in group quarters were included in the sample; in all other places, one sixth of the housing units or group quarters were sampled. Overall, approximately 19% of U.S. housing units were included in the census sample.

Of course, all employment data provided by the census are subject to sampling errors. These can be estimated using standard statistical techniques described in technical documentation available from the Census Bureau. In general, when the number of individuals reported in a particular classification such as occupation, sex, or location is in the hundreds, the sampling error can, for most practical purposes, be ignored. When the number is less than 100, however, the sampling error can be relatively large and effectively mask any change from one census to the next. This should be remembered when reviewing the table that shows dp employment by state.

To be a little more precise, a conservative estimate of the standard error due to sampling is the larger of 16 or 2.9 times the square root of n where n is the number of individuals reported. Thus, for n = 100, 1,000, and 10,000, the standard sampling errors are 29, 92, and 290, respectively. These numbers suggest that national totals for the four dp occupations should only be quoted to the nearest thousand, and that care should be taken when interpreting data and especially change data from the less populous states.

Looking at the data by state, it is clear

Computer operator positions in the South increased 313% in the '70s.

that there has been significant growth in all states for all four dp occupations. Some states, however, have grown faster than others. In particular, California, which in 1970 had approximately the same dp employment as New York, had moved way ahead by 1980—its 132% growth, to 171,039, was more than double the 60% increase for New York. Similarly, Texas, Florida, Virginia, Georgia, and Washington among the larger states show well above average growth. On the other hand, below average growth occurred in the industrial states of the Northeast and Midwest. The overall growth rate for the snow belt, 83%, was dwarfed by the 141% increase for the West and South.

The overall pattern of growth shows up very clearly if the states are divided into two groups—the 14 states in New England, and Mid-Atlantic, and East North Central regions (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, Pennsylvania, Illinois, Indiana, Michigan, Ohio, and Wisconsin) in one group and the remaining 36 states and the District of Columbia in the other. Adding the total employment figures for the four dp occupations for the states in these two groups, the growth in the 14 states in seen to be much less than in the rest of the country. A similar pattern holds for the four dp occupations taken individually. Computer operator positions in the North increased at a 209% rate in the '70s; in the South, the increase was 313%.

It must be remembered that the census reports the occupations of individuals according to the state of residence, not the work location. This accounts for the relatively low numbers reported for the District of Columbia, where many workers live in neighboring Maryland and Virginia suburbs. In this case, the census reports for the Washington, D.C. Standard Metropolitan Statistical Area (SMSA), which includes the nearby suburbs, are more relevant. For 1980, they show a total dp employment of 47,499. This puts the Washington, D.C. area in fourth place among SMSAs with respect to dp employment, immediately behind New York, Chicago, and Los Angeles-Long Beach.

It is interesting to note the unusually high proportion of systems analysts and programmers in the Washington, D.C. SMSA as compared to New York, Chicago, and Los Angeles. The 50% larger analyst population in D.C. presumably reflects the pattern of dp employment in the federal government.

The census also reports employment by sex and ethnicity. This presents an opportunity to see how well the dp field is doing with respect to equal opportunity. Fortunately, the data show progress in all four dp occupations.

Sharpest increases for female and black employment in the data processing industry were shown in the systems analysts and computer operator categories. Female computer operators were once in the minority but are now in the majority with 59.2% of the positions, probably due to the aforementioned rise of the small business computer and the microcomputer making clerks into computer operators. Black programmers were 3.6% of the total but are now at least 5.7%. Female programmer numbers also increased, from 22.5% of the total to 31.2%. Fewer males are entering data at computer centers these days, as the percentage of female key entry operators is now 92.4% from 89.8% in the 1970 census.

A detailed evaluation of the sex and ethnicity data is clearly beyond the scope of this article; readers are left to draw their own conclusions. The change in the proportion of female computer operators, however, merits comment. The Census Bureau insists that the numbers for male and female computer operators were not reversed. Further confirmation comes from recent Department of Labor data on 1982 employment that give an even higher female computer operator percentage—63.3%. Since the sex ratio is not in accord with some observations of a number of larger computing facilities, the only rationalization apparently remaining is that mentioned earlier, namely, that erstwhile clerical employees at places with micro or small business computers are reporting themselves as computer operators because that is, in reality, what they spend most of their time doing. Despite this tremendous surge of females into computer operations, males need not give up hopes of computer operator jobs. The growth in operator requirements was such that male employment increased by 107% from 1970 to 1980; there should be plenty of room for growth in male computer operator employment in the coming 10 years. ●

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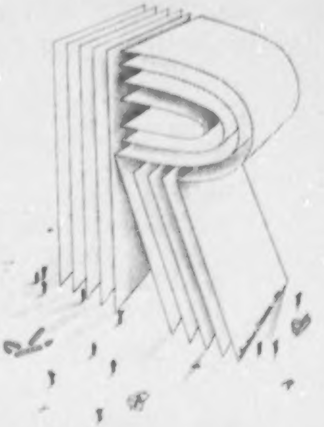
A seminar on IDMS/R.



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Boston/ Cambridge, MA	Sep. 20
Calgary, ALTA	Sep. 15
Charlotte, NC	Sep. 22
Chicago, IL	Sep. 7
Cincinnati, OH	Sep. 12
Cleveland, OH	Sep 15
Columbus, OH	Sep. 9
Dallas, TX	Sep. 7
Davenport, IA	Sep. 27
Des Moines, IA	Sep. 28
Eau Claire, WI	Sep. 21
Evansville, IN	Sep. 27
Grand Rapids, MI	Sep. 15
Hartford, CT	Sep. 14
Houston, TX	Sep. 29
Indianapolis, IN	Sep. 20
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Lexington, MA	Sep. 7
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Rochester, NY	Sep. 13
Sacramento, CA	Sep. 27
St. Louis, MO	Sep. 6
Salt Lake City [illegible]T	Sep. 27
San Diego, C[illegible]	Sep. 13
San Francis[illegible]	Sep. 15
Savannah, G[illegible]	Sep. 29
Seattle, WA	Sep. 29
Southfield, MI	Sep. 15
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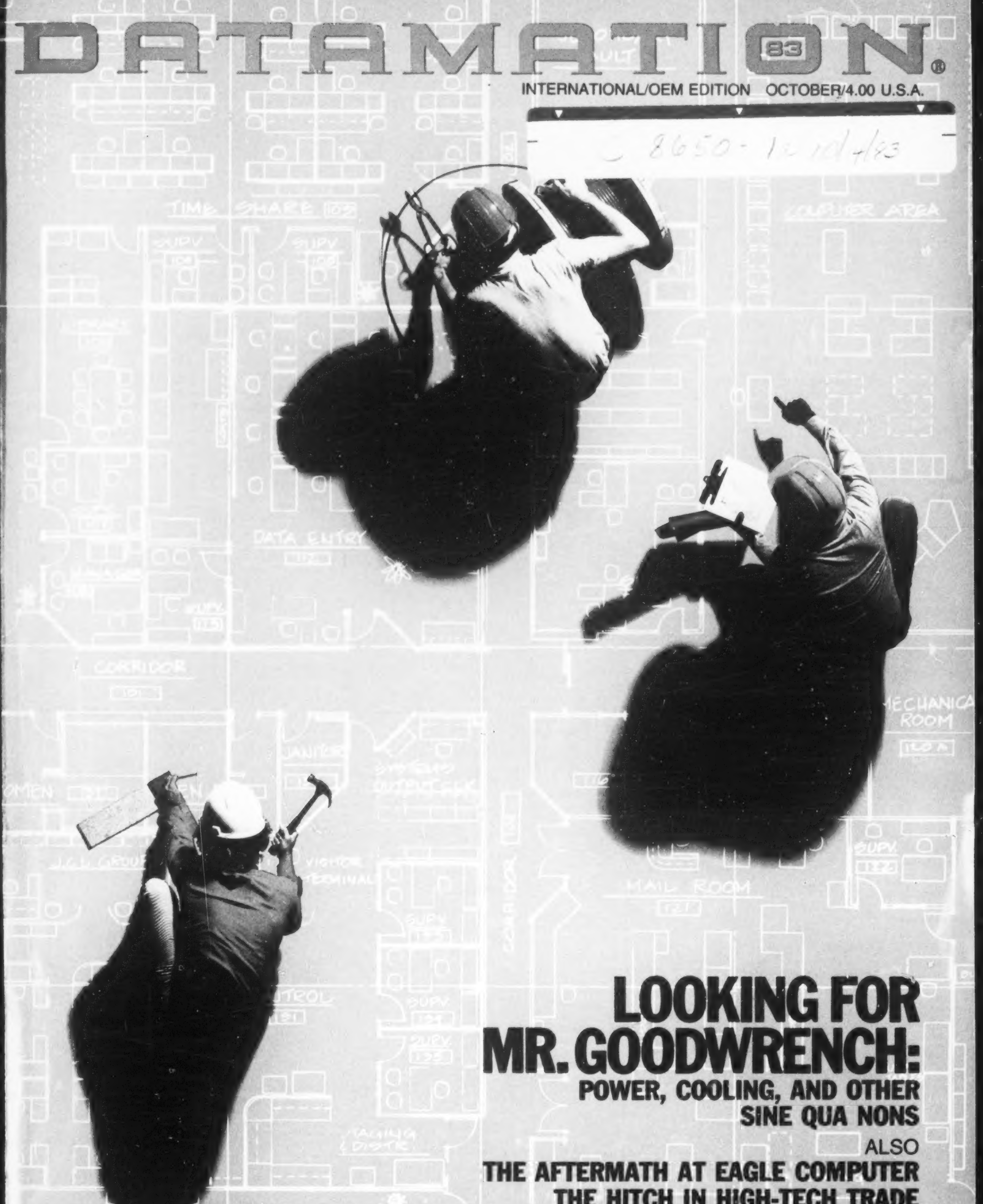
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COVER PHOTOGRAPHS BY STEVE COOPER

Faithful fad followers, the Japanese have nevertheless been slow plugging PCs into the office.

BUSINESS PCS: THE CRAZE THAT HASN'T CAUGHT ON

by Edward K. Yasaki

In Japan, where the appearance of conformity is considered so important, fads are faithfully followed. Youngsters stroll through downtown Tokyo wearing stylish T-shirts with English slogans printed on them. The fact that what's scrawled on these shirts is incomprehensible, even to those who understand English, doesn't seem to faze the wearers, who think themselves the height of fashion.

There's also conformity in Japan's business world, where small business systems have been the rage in small and medium-size enterprises. Market acceptance of these wares, however, began only after the influential Americans jumped on the bandwagon. This acceptance lag, which tends to be short in terms of clothing and longer for computers, has so far kept the personal computer out of corporate offices in Japan.

It's a slightly different story for microcomputers, which became hot items on the Japanese consumer market after they won raves in homes across America. So, while micros for home use—essentially game playing—have sold extremely well, personal computers with business software have yet to catch on in Japan.

Overall, office automation, which is attracting more and more advocates in the States, is little more than a fashionable buzzword in Japan. As reported last year in DATAMATION (December 1982, p.214-16), office automation in Japan basically means word processing, which in itself is hampered by the serious problem of inputting kanji characters. Despite the inherent stumbling blocks, the Japanese are expected to once again follow Uncle Sam's lead, becoming enthusiastic users of OA gear.

Vendors—both domestic and foreign—are hoping to capitalize on the OA craze when and if it comes to Japan. Anxiously anticipating the accelerating sales, equipment suppliers are busy preparing a plethora of products for the fledgling market. One of the companies earliest off the starting block was Yamagiwa Corp., a large retailer of electrical appliances and consumer electronics products. Tomohiko Suzuki, general manager of Yamagiwa's Office Automation Department, says that the company's OA retail operation, launched some three years ago, will pull in 10% of the firm's $200 million in sales this year.

Suzuki estimates that there are approximately 1 million micros installed in Japan, 80% of them gathering dust in people's homes. He further speculates that only about 5% of current purchases are for work applications. His own best-sellers are standalone word processors, followed by facsimile transceivers, copiers, and answering machines.

Japan's craving for personal computers, nonetheless, remains strong. Some 762,000 personal computers valued at approximately $1 billion were shipped to the domestic market in fiscal '82, compared to only 287,000 machines the year before. In contrast, only 79,000 PCs were exported.

The Japan Electronic Industry Development Association predicts that if current conditions continue, the home market will absorb another 1.2 million personal computers during the current fiscal year, which ends March 31, 1984. By fiscal 1990, 16-bit machines are expected to be outselling 8-bit models.

THE WP WAYS OF PC UNITS

In such a market, where the concept of integrated software is still foreign and electronic spreadsheet applications nonexistent, personal computers' initial usage in the office will be for word processing chores. This became especially obvious last spring, when IBM introduced its Japanese P.C. with kanji processing software. The enthusiastic response of U.S. users to Apple Computer's announcement of the Lisa PC in January was echoed in Japan when IBM unveiled its 5500 Multistation and its Japanese language word processing software. IBM couldn't have made a bigger hit if it had dumped JCL.

Word processing, of course, is not the only application for personal computers in Japan. Some innovative companies are looking to expand PC power into other application areas. One of those companies is Nomura

FIG. 1

JAPANESE PERSONAL COMPUTER SALES

YEAR	OVERALL SHIPMENTS Number of Units (In thousands)	Sales Volume (In $ millions)
1982	762	964
1983*	1,015	1,183
1984*	1,492	1,569
1985*	2,003	1,962
1990*	5,047	4,109

*Estimate

Source: Japan Electronics Industry Development Association

Once the kanji input problem is solved, office automation will become more widespread in Japan.

Securities Co. Ltd., Japan's largest securities firm. A pioneer in the use of personal computers in the office, Nomura Securities is now capitalizing on the machine's graphics capabilities.

The Japanese securities company has begun using 16-bit personal computers in its CAPITAL (computer aided portfolio and investment total analysis) system. The PCs, which are supplied by Nomura, are loaded with software that enables them to display kanji characters and alphanumerics. The systems are made by seven Japanese vendors—Hitachi, Fujitsu, NEC, Oki, Mitsubishi, Sharp, and Toshiba. Nomura also plans to use PCs from Apple and IBM.

The on-line CAPITAL system provides macroeconomic and financial data, which includes information on the exchange and money markets of major countries, data on Japanese corporations and their financial activities, and analytical information on equity and debt securities markets in Japan and elsewhere. This information, which appears in the form of charts, graphics, and tables, is disseminated over a communications network that went on-line in May 1982.

Scheduled to be extended overseas this month, the CAPITAL communications net will link 1,000 customers—institutional investors and large corporations—around the world. Two large-scale Hitachi M-280 mainframes serve as host processors for the network.

Nomura Securities, which in the fiscal year ended September '82 generated revenues in excess of $1 billion, has 105 branch offices in Japan and 14 branches abroad. Its dp system development and operation are handled by a sister service bureau organization, Nomura Computer Systems Co. Ltd., which derives about 40% of its revenue from Nomura Securities. Under development are four large systems based on three packet networks scheduled for completion by 1985. The company's investment in these four systems, including only hardware and communications, exceeds $200 million.

The securities firm alone is so large that it has one network based on five large-scale mainframes. The CUSTOM (computer utility system for total management) uses two Univac 1100/82s, one Hitachi M-280H, two M-200Hs, and 4,200 terminals. For a company with about 8,600 employees, that's an average of about one terminal for every two employees. The bond department, which has 150 employees and more than 200 terminals, probably has the most terminal facilities.

One of the corporate objectives was to be able to use a wide variety of terminals from different vendors that could communicate with any kind of host computer. That compatibility was a key factor, since the terminals had to be able to access the mainframes that handle data on stock and bond trading and other information services. Although a transaction originating at a terminal may run on several computers before returning, the requirement was for a response time of less than three seconds.

For CUSTOM, Nomura developed a packet-switched network that is based on Hitachi's HNA (Hitachi network architecture) but modified so that it could also run on Univac mainframes. According to Nomura Computer Systems' executive managing director, Yasuichi Toda, this was the first packet-switched network in Japan. Beating even Nippon Telegraph & Telephone Public Corp. (NTT) to the punch, Nomura launched its packet net in April 1980.

PLUGGING IN THE PACKET

In order to get worldwide sales office on-line to the mass of information and services available in Tokyo, Nomura has begun phasing in the COMPASS system, a larger packet-switching network that uses a dedicated line. Linking phone, fax, teletype, and terminals, the system uses nodal processors located in Tokyo, Osaka, New York, London, and Hong Kong. Some 400 video terminals worldwide are slated to go on-line to the Hitachi M-200 host processor. The three networks—COMPASS, CUSTOM, and CAPITAL—all talk to each other, another requirement imposed by Nomura Securities.

A fourth system at Nomura evolved from a study that started in July 1980. An office automation promotion committee, consisting of personnel from the securities and computer company, had the job of taking users' small jobs and word processing applications off the large mainframes and putting them onto dedicated wp systems and PCs. The resulting system, called COSMOS (communications service for multi-office systems), illustrates the Japanese penchant for acronyms. This office automation scheme uses a dedicated line to link the firm's 105 branch offices for the transmission of phone and fax messages through PBXs. Each branch has one or more PCs, not necessarily connected to the COSMOS network, but that's the idea. All branches are also equipped with a small fax terminal.

Readily available in Japan through the phone company (NTT), these fax machines enable the branches to communicate with any outside company comparably equipped. The COSMOS digital network has five nodal processors that can store and forward fax and data. Voice signals, however, are still handled in analog form.

Nomura's Toda reports that despite three years' experience with office automation, the company still has many user troubles. The biggest problem in OA, he explains, is kanji input. Once this is solved, he says, office automation in Japan will become more widespread, making such applications as electronic mail possible.

To encourage employees to write applications for their PCs, Nomura holds training sessions on how to use and program the system. It also sponsors contests to see who can develop the most interesting programs. Approximately 300 PCs are being used by the company's 8,600 employees, who have written around 1,000 simple programs. But since there are so many similar programs, a software exchange program is being considered.

What would it take to get more personal computers into the company? Lower prices and more memory capacity, replies Toda. He expects lower-cost workstations equipped with software for word processing, graphics, and computation to be on the market within the next few years. It's these machines of the future, he says, that will help advance the spread of office automation in Japan.

CARTOON BY LEO CULLUM

Australian products are helping satisfy the world's appetite for programs.

THE FERTILE FIELD FOR SOFTWARE

by Norman Kemp

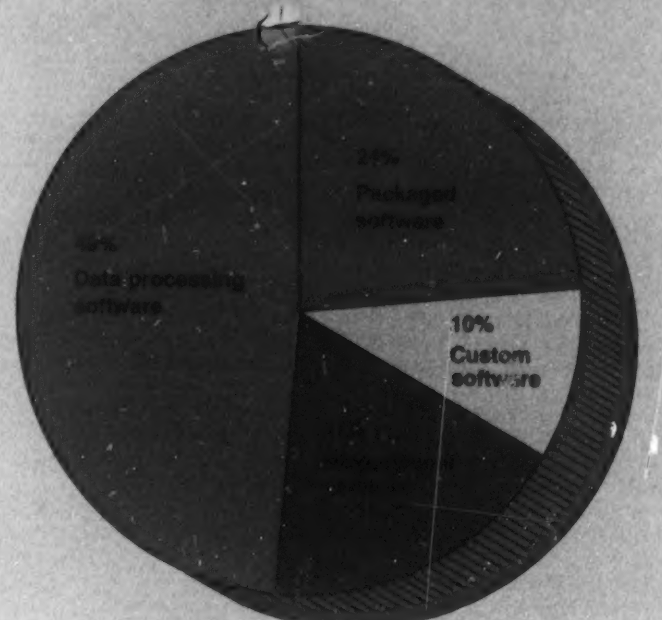


FIG. 1
AUSTRALIAN SOFTWARE SALES BY SECTOR

Change is the name of the game in Australia, where a fledgling but flourishing data processing market is rapidly coming of age. Helping lead the march to market maturity is the nation's software sector, which has grown from a handful of cottage enterprises into a robust industry.

While welcoming this newfound recognition, Australian software developers and systems houses are also bemoaning the fact that this elevated status has catapulted them into a new tax category. The change came last year when the country's customs inspectors, investigating the market, decided that the domestic software companies were indeed pulling in enough profits to make their wares—local and imported—eligible for tax.

These taxing troubles, already inflicted on hardware vendors, came as a shock to Australia's software suppliers. The shock was felt the most by hundreds of smaller Australian firms, which unexpectedly received notice that they had to pay retroactive taxes as well as future levies that could reach as high as 27½%.

As protests multiplied, the taxation issue became the rallying point for local software companies to get together to form a lobbying group to represent their interests. The resulting Australian Software Houses Association is doing just that. Attempting to tackle the taxation question, the group is currently appealing its case to reduce or remove the sales duties on software products to the Industries Assistance Commission.

Whatever the outcome, it's clear that the software scene in Australia is changing dramatically. Local programmers and analysts, once cloistered away in the back office, are going through a metamorphosis—a metamorphosis that will force them to concentrate more on professional presentation and packaging. They will also have to muster skillful marketing techniques to get their software products known and used, both domestically and abroad.

The pecuniary evaluation of their work by Australian Customs has also caused software specialists to realize that they no longer belong to a cottage industry that provides small-time academic services. Instead, they are part of a very competitive and profitable field, where survival depends upon the ability to maintain high standards and innovative approaches to the demands of commercial computing.

The software needs in Australia's commercial computing market have historically been met mainly by outsiders. Those outsiders are the major U.S. and U.K. software companies that operate in Australia through subsidiaries, branch offices, or licenses and franchises.

While those foreign firms chalk up the most sales, the local software and services industry is still largely Australian-owned. The Australian Computer Software Services Association (ACSA) estimates that there are approximately 400 independent software/services companies in Australia that employ around 7,500 people. Modest by international measurements, this work force nonetheless helped provide the local dp industry with some $450 million (A$400 million) worth of software and services last year.

Australian software suppliers would like to be more active participants in the world market.

SOFTWARE SALES SECTORS The principal sales sectors in 1982 were dp software, which accounted for $195 million (49%) of the take; packages software, $96 million (24%); custom software, $42 million (10%); and professional services, $67 million (17%). To put those figures in context, the overall installed base of computers in Australia was 88,476 last year. Included in this total were 2,236 general purpose mainframes, 17,620 minicomputers, 11,540 small business systems, and 55,000 intelligent and dumb terminals.

As systems usage spreads, the demand for software and services will also accelerate. By 1987 the Australian market for systems software alone is expected to reach $400 million. A five-year forecast predicts the overall software/services sector will grow an average of 20% annually.

Software writing in Australia is concentrated in three main areas: the simple revision of imported applications packages, the conversion of incompatible system programs, and the development of software mainly for the local market. Package modifications are done chiefly to accommodate the different national accounting methods (Australia uses British methods.).

More extensive changes are usually handled by the package supplier, which is often a mainframe or minicomputer firm. While many companies use their own inhouse programmers for these revamp chores, there's still a growing demand for the package tailoring services of third party houses. This demand has been spawned by the rapid increase in the use of desktop microcomputers by Australia's business community.

Avid buyers of foreign computers, Australians have had to tackle many software conversion chores. Local programmers must be able to handle not only U.S. and American computers, but also Japanese machines running the gamut from micros to mainframes.

Although software revisions are often done in-house in larger Australian organizations, it's still a costly and cumbersome task. The costs, of course, come mainly from having to hire extra programming help to do the software rewriting. An alternative is to hire an outside firm to do the overhauls on an as-needed basis. Over the past few years several companies specializing in mainframe conversions have made their way onto the Australian software scene.

While such companies may make inhouse programmers' lives easier, they still don't completely obviate the need to step up dp staffing. Australia, like most other countries, suffers from a lack of good programmers and analysts. The Australian consulting firm Datec estimates the 1982 programmer shortage at around 5,000—a drop of some 3,000 from 1981. The need for fewer programmers was largely due to in-house cutbacks caused by the recession.

The recession, which ripped through other Australian industries, has been relatively kind to the software sector. Most industry observers, in fact, feel that the Australian software industry has been almost recession-proof. Sales of packaged software and services, which have indeed been healthy, are expected to continue strong for the foreseeable future.

These good sales statistics have encouraged domestic vendors to investigate new marketing opportunities. Entrepreneurial by nature, Australian software companies are anxious to spread their wings and their wares overseas.

To help achieve those export goals, the country is counting on the flexibility and foreign flavor inherent in their work force. While local universities and technical colleges have served as a major recruitment channel, Australia has also been able to augment its software staffing with expatriates from Britain, South Africa, New Zealand, India, the Philippines, and the U.S.

The cosmopolitan makeup of the Australian software sector is reflected by the wide range of applications that the local industry is willing to tackle. This adaptability factor has proven beneficial to American as well as Japanese manufacturers that need people who have the expertise to work on and develop systems for other markets—particularly the British-oriented and Asian territories. Accounting, legal, educational, and public institution software are only a few examples of some of the U.S.-based products that have been tested and modified in Australia for overseas consumption.

Data General, Digital Equipment, Hewlett-Packard, IBM, Perkin-Elmer, and Prime are among the American hardware companies that have sponsored or patronized Australian software houses. The resulting wares, which have been sold throughout the world, range from vertical applications packages to database systems that run on a variety of machines, from micros to mainframes. Other outside software houses are also keenly interested in Australian software. Currently at the head of that list are Britain's Logica and Management Sciences America, headquartered in Atlanta, Ga.

Focusing on the home front, Australian software vendors are working on computer aided design/computer aided manufacturing (CAD/CAM) applications. Those applications will be sorely needed as the local manufacturing plants begin automating. There is still scant use of computerization in Australian factories—a situation that is gradually changing.

SPECIAL SOFTWARE SCHEMES There's also been development efforts in Australia to come up with high-level software in such areas as micro-mainframe communciations and local area networks (LANs). Additionally, the country has been conducting advanced software research into customized semiconductors for the customer and scientific markets.

Outside the research realm, Australia continues to nurture a hunger for overseas markets. The pioneering product on the Australian software export scene was GRASP, an IBM DOS resource management program developed in the late '60s by Australian entrepreneur Boyd Munro. Virtually unrecognized in his homeland, Munro spent nearly 15 years abroad setting up his own international software company, SDI.

Now back in Australia, Munro has come up with a new IBM DOS/VSE product. During his absence, the spirit of export lived on in Australia, as software specialists custom tailored scores of applications programs for their international clients.

Hoping to expand their middleman role, Australian software suppliers would like to be more direct and active participants in the worldwide market. Despite this drive, however, very few national companies have set up offices overseas. Confident that their products could win a respectable foreign following, Australian firms are nonetheless wary of the risks involved in doing business offshore. They realize full well that America, the biggest and most potentially lucrative market of them all, is also the hardest to break into without substantial venture capital.

These crucial resources are in fact scarce in the Australian software industry, despite future growth projections that tend to minimize the heavy costs of producing world-quality software, even for the home market. Meanwhile, that home market remains a fertile research and development domain for foreign firms. Amdahl, Prime, Storage Technology, and Wang, for example, have all announced plans to pursue various research schemes on Australian soil. Sperry has also expressed an interest in using the Systems Research Institute in western Australia for program development.

And thus the Australian partnership pattern continues. Under the various cooperative pacts, local software houses will work closely, as they have in the past, with outside hardware manufacturers, while overseas software producers handle the overflow. The approach promises benefits to both sides. The foreign firms can take advantage of a willing and talented team of technicians, while the aspiring Australian developers can build recognition for their software products in hopes of reaping rewards from worldwide markets.

Portable computers are being packaged by oems for salesmen, writers and the U.S. Army.

MOBILE MANIA: A NEW MARKET FOR OEMS

by Richard J. Matlack

The market for mobile computers is expected to grow from 527,000 units in 1982 valued at $372 million to 5.1 million units in 1987 valued at $3.1 billion, for a compound annual rate in excess of 52.8%. While most of these units will be sold directly to end users, approximately 20% of the 1987 total will flow through value-added resellers. The market for mobile computers offers exciting opportunities for suppliers, resellers, and end users as technological advances allow the incorporation of powerful computer systems into small, low-cost, easy-to-use packages. Mobiles will become an important part of the desktop computer industry, comprising about 10% of all such shipments by 1987, according to vendors, dealers, and end users.

Several thousand questionnaires, telephone interviews, and in-person visits were conducted to determine the financial performance of the industry over the past two years and to build an industry model forecasting future market growth. Officials of the various vendors, dealers, other middlemen, and end users were polled as part of a quarterly survey of industry conditions and outlook. The consensus is that mobiles are an increasingly important market segment, not just for the vendors assembling the sewing-machine to calculator-sized devices, but also for dealers and value-added remarketers.

Mobility is an accepted and widespread characteristic of our modern technological society. As a computer characteristic, mobility fits naturally within this society and has begun to attract significant attention among suppliers and users of computers. Technological advances, such as the shrinking size of mass memory systems, are allowing the implementation of powerful, easy-to-carry computers that can be taken wherever the user goes. These technological developments are occurring just as computers are beginning to achieve widespread acceptance among a broad cross-section of society.

The first hint of the importance of mobility to computational devices came with the mushrooming of the handheld calculator market in the early 1970s. Later in the same decade it was the personal computer that first combined true computer functionality with low-cost and small physical size, making this class of equipment readily adaptable to home use and even offering rudimentary levels of mobility. How many of us carried an Apple home from the office on weekends at great risk to life and limb?

The introduction of the Osborne I with its carrying-case packaging and under-the-airline-seat size in 1981 began to stimulate conceptualization and design of full-capability computers that could be carried conveniently by users. With the introduction of the GRiD COMPASS, the Epson HX-20, Radio Shack 100, COMPAQ I, HP-75C, Teleram T-3000, and Sharp 1500 over the past two years, the field has virtually exploded. At least 25 mobile computers are available today and rumors abound that new models are imminent from significant suppliers as well as new startup companies.

There are many different levels of mobility available with the current generation of devices. The smallest and most mobile of these devices are handheld calculators and portable terminals, both of which have limited functionality. The least mobile of today's computers are the desktops and free-standing systems, i.e., minicomputers and mainframes. While these systems are full-function computers, the ability for an individual user to easily move them is limited. Between these two extremes are three distinct mobile computer categories:

- *Handheld computers.* These systems are characterized by small size, moderate main memory (usually less than 16K bytes), one to four lines of liquid crystal display, a less-than-full-sized keyboard, limited peripherals, and an internal power supply. These systems, like all mobile computers, are programmable in a standard higher-level language such as BASIC. Sometimes referred to as briefcase computers, the Sharp 1500 and the HP 75C are good examples of this class of system. Retail prices range from $300 to $800.
- *Portable computers.* These systems merge the functionality of desktop computers with the portability of handheld computers, with memory size approaching or exceeding 512K bytes. The display, however, is limited, typically, to four or eight lines by 80 characters of LCD. The keyboards are full-sized typewriter style and the power supply internal. Sometimes called lap computers, examples of this class are the Tandy 100, Epson HX-20, Teleram T-3000, and the Gavilan I; prices go up to $4,000.
- *Transportable computers.* These systems integrate a small crt screen, typically 5 inches to 9 inches, half-height memory peripherals, and full-sized keyboards into a special package that makes the system movable. Power requirements are normally met from external sources and the weight tends to exceed 20 pounds. Also called suitcase computers, the Osborne Executive, KayPro II, and COMPAQ are representative of this class, which runs at least $1,000.

Many portables are built around the Intel 8088 microprocessor used in the IBM Personal Computer, to give the portable computer user access to programs designed for the MS/DOS operating system. Other mobiles contain the ever-popular Z-80 and CP/M microprocessor and operating system duet.

Mobile computers are being incorporated in a wide variety of applications where users are on the move. While traveling, business persons now use mobiles for word processing, data collection, and sales support. Students take them to class the way a previous generation took calculators.

Probably the earliest application to emerge was that of having a computer that could be taken home from the office to continue projects started during the business day. This application is expected to become even more important as mobile computers are designed that are compatible with larger desktop computers. The introduction of mobile computers like the COMPAQ supplements use of the IBM Personal Computer at the office.

The need for a mobile word processing system is particularly acute in the newspaper industry, where reporters need a convenient means of compiling, editing, and transmitting their articles from the field. A number of companies like Teleram have specialized in providing dedicated terminals for this application and now offer mobile computers to accomplish the same function as well as spreadsheets and other non-wp functions.

Field data collection is utilized in a variety of industries such as market research and warehouse management. This application has been automated to a degree with portable data collection terminals that were limited in function and flexibility. Essentially they were portable dumb terminals. Portable computers now provide a natural means of extending the capabilities of data collection terminals to meet these application needs.

Many types of field sales organizations can benefit considerably from the availability of mobile computers for quoting, order entry, order status retrieval, and even instantaneous invoicing. A major opportunity seems to exist in the area of insurance sales, where a mobile computer could reduce the number of sales calls required to help a client reach a decision. The ability of the system to run through various types of "what if" scenarios is particularly useful in developing the right type of insurance plan for the prospect and then determining the rates on the spot.

The field audit teams of public accounting firms often require the ability to gather, test, and compute data at their clients' offices. Mobile computers offer significant potential for meeting the needs of this application and for working through a communications network with the home-based data processing system.

The use of computers in education is growing dramatically at all levels. As more colleges and universities require students to own computers, the benefits of mobility will become very attractive, allowing students to carry their systems with them to the classroom and home again to accomplish homework assignments.

Also, many new and currently undefined applications will certainly develop as the performance of the mobile computers increases concurrent with sharp price decreases. With the increasing availability of user-friendly software, more users, who currently are somewhat reluctant to use computers, will be attracted to the virtues of the mobile computer.

VARS APPLICATIONS

Value-added resellers, usually called VARS, are becoming increasingly aware of the opportunities available for them to incorporate mobile computers into systems that meet specific application needs. Oems that specialize in sales support systems are especially active in packaging mobiles.

Broadmoor Computer Systems, Los Angeles, is developing a set of application packages to meet the needs of outside salesmen in a variety of industries. The packages are designed to provide order processing capability through an internal modem that allows up-loading and down-loading of information from the field. The application packages are designed around a generic forms and database capability that can be applied across a variety of industries. The objective of the system is to increase salesman efficiency by reducing the number of sales calls required to close an order—the computer can eliminate the trip back to the office for order confirmation, for example. In addition to order entry, scheduling, and order status, the Broadmoor system will provide ancilliary functions, such as expense record keeping, telephone directory maintenance, personal database, appointment keeping, job costing, and estimating.

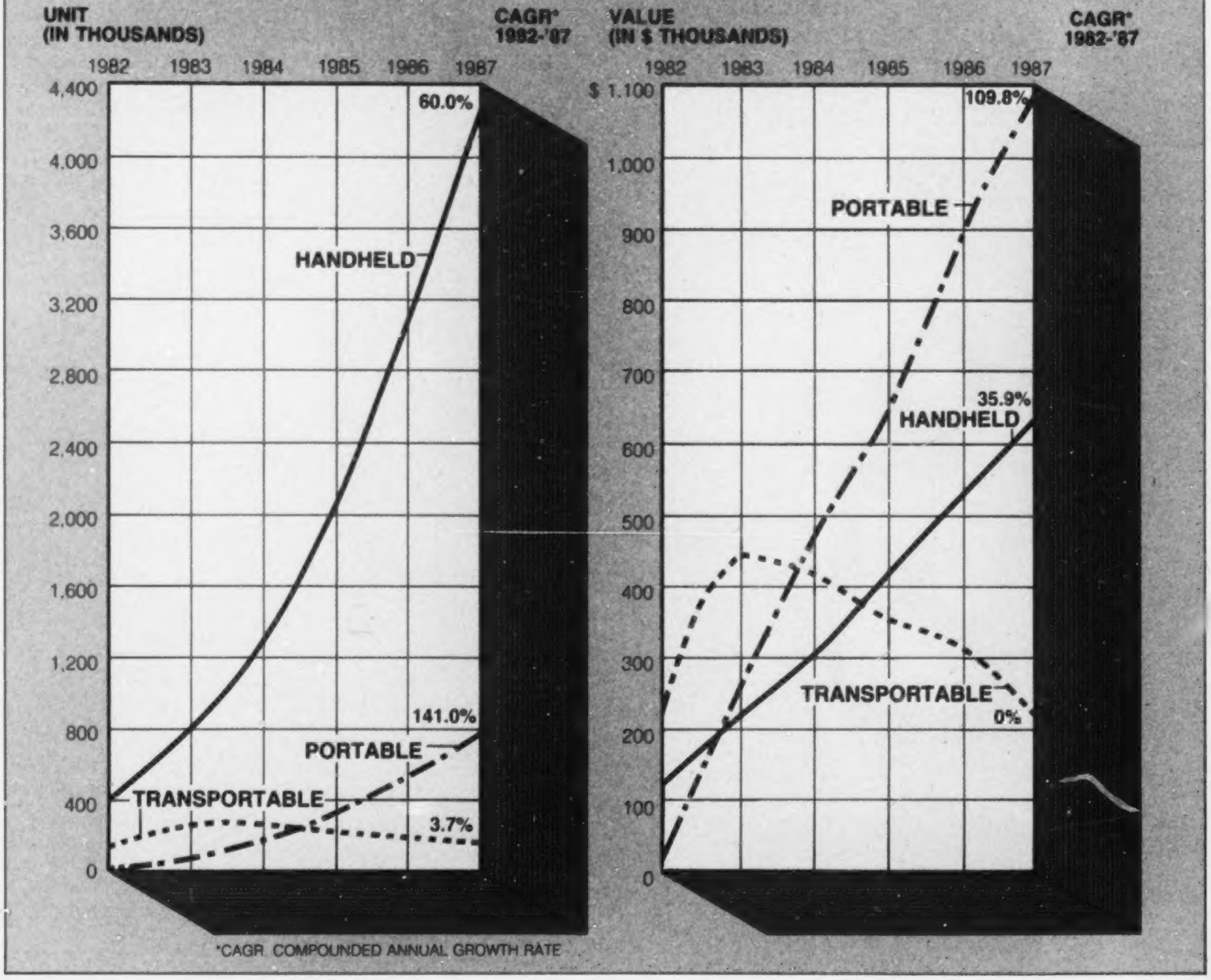
"And how are we this morning?"

CARTOON BY NICK HOBART

On-the-road salesmen can offer product price quotes on the spot.

FIG. 1

WORLDWIDE MOBILE COMPUTER SALES ESTIMATES



*CAGR COMPOUNDED ANNUAL GROWTH RATE

Broadmoor looked at a variety of vendors before selecting the Gavilan I. The major selection criteria were size, weight, memory size, performance, the availability of an internal floppy and a full-sized keyboard, and the flexibility of the display to act as a window of a full-sized screen, according to company officials. Another critical selection factor was the availability of a standard operating system—in this case MS/DOS—to move to different hardware configurations if necessary in the future. Finally, the availability of support oriented toward the needs of the resellers was key to the selection.

Several software houses are taking their IBM or Apple programs and packaging them with mobiles. Maxie Systems Ltd. Inc., Austin, Texas, writes software for the insurance industry. It specializes in packages that deal with the complexities of universal life insurance plans and offers systems for the Apple IIe and IBM Personal Computer. As an extension of its insurance industry applications, Maxie has a project to port its software for life agents onto a portable computer. The objective is to improve the agent's efficiency in preparing various insurance plan options and, most importantly, to cut down on the number of calls required to allow a prospect to reach a decision: with a portable, an agent can analyze a prospect's current life insurance plan and compare it against new alternatives.

For example, if the client doesn't want to increase his premium but wants to maximize coverage, the program will make the necessary calculations. In the complex area of universal life, a computer is required to calculate the rates, coverage, and payout tables that the client can tailor to specific insurance requirements.

Maxie currently has approximately 100 of its Apple and IBM systems installed at insurance companies like West Coast Life, American Founders Life, and Royal Life. In investigating the options for a portable product, two criteria were prominent: an integral printer and MS/DOS. After looking at several alternatives, Maxie opted for the Gavilan system and is in the process of porting the IBM-P.C. applications over to the Gavilan I. Future applications that are being pursued as possibilities for portable computers include home and auto insurance, two markets that offer

CHART BY CYNTHIA STODDARD

significant potential in terms of the number of agents that could use the systems.

MILITARY COMMAND, CONTROL An interesting and perhaps unique application of mobiles is being developed for battlefield command and control applications by BDM Corp., a McLean, Va., systems integrator. The new battlefield doctrine of operations is centered around air-land coordination to allow for successful operations in areas where U.S. military forces might be significantly outnumbered, as might occur in the Middle East. To coordinate its tactics, logistics, and intelligence gathering efforts, the military is implementing field computer systems for messages, resource management, and information consolidation.

One application includes the GRiD Systems Corp.'s COMPASS as the battlefield unit. BDM as the systems integrator is developing software and hardware for the COMPASS to communicate, over single-channel radio, necessary tactical information.

Interestingly, the functions required in the field are similar to standard office automation—message handling, text processing, database management, and other basic functions for which the COMPASS was originally intended. New menus are being developed to meet specific battlefield applications. For example, a company commander might call up an enemy tank menu to fill in the type and number of tanks identified in his sector of operations. The data would then be digitized and transmitted to a command post for consolidation and action orders sent out to the company commander based on the situation analysis.

GRiD's COMPASS was selected by BDM because of its inherent ruggedness—there are no moving parts in the COMPASS except the keyboard—and the easy-to-use software. Although the COMPASS does not meet current military specifications for ruggedness, it may be acceptable with minor or no additional changes for the large number of military applications that are being developed.

These examples indicate the applications opportunities that suppliers have been able to identify by consciously focusing on the needs of VARs. A number of other suppliers, like Teleram and Epson, are in active discussion with VARs to implement new applications on their systems. The time has arrived for mobile computers, and the participation of VARs will play an important role in the development of this important market opportunity. ◆

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Heart attack or stroke could knock you down on your way up.

You're working for the challenge, the satisfaction, the success. The last thing you want is a heart attack or stroke. Yet, nearly one million Americans die of heart disease and stroke every year. And 200,000 of them die before retirement age.

The American Heart Association is fighting to reduce early death and disability from heart disease and stroke with research, professional and public education, and community service programs.

But more needs to be done.

You can help us find the answers by sending your dollars today to your local Heart Association, listed in your telephone directory.

Put your money where your Heart is.

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